SCIENTIFIC AMERICAN

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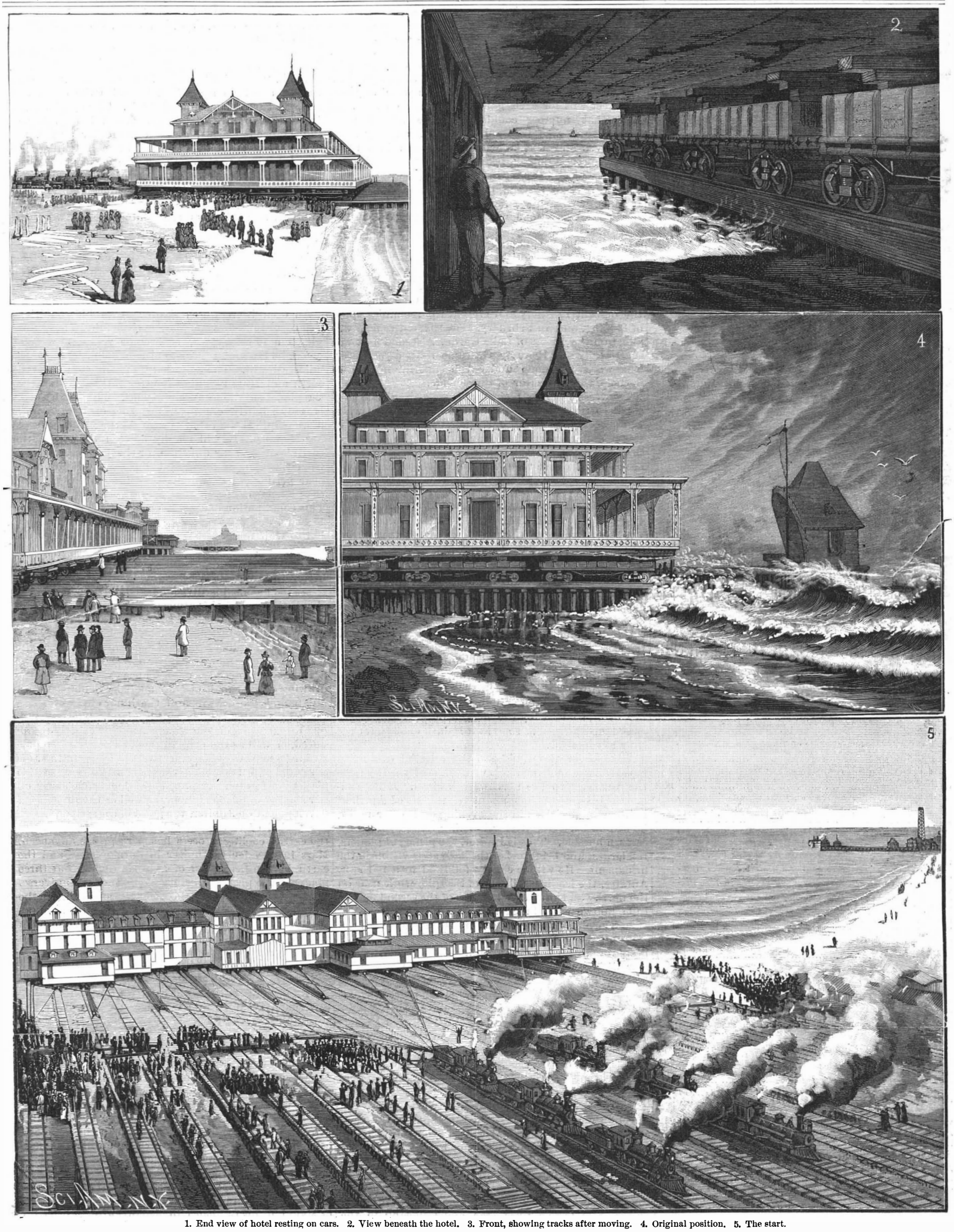

1. End view of hotel resting on cars. 2. View beneath the hotel. 3. Front, showing tracks after moving. 4. Original position. 5. The start.

MOVING THE BRIGHTON BEACH HOTEL—GENERAL VIEW OF THE OPERATIONS.—[See page 230.]

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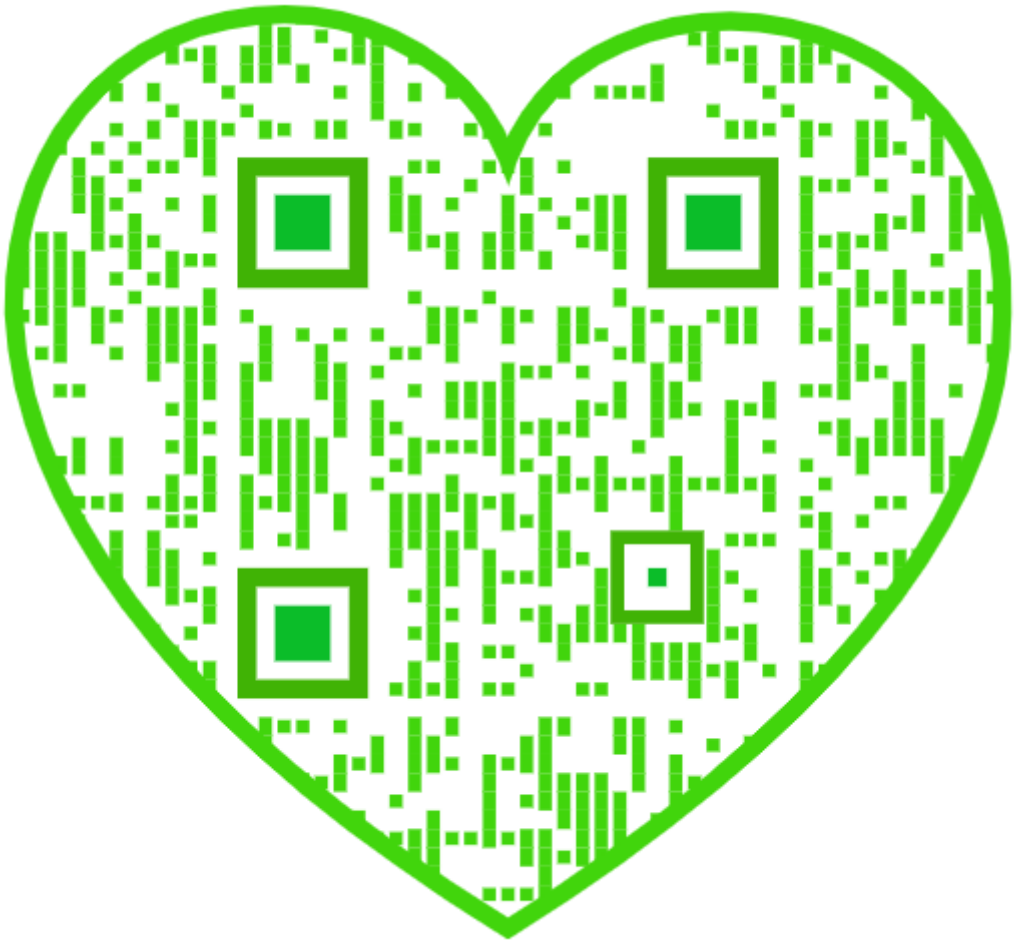

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A VENETIAN SHIP RAILWAY.

An interesting achievement of the fifteenth century was recently described by Mr. E. L. Corthell before the Engineers' Club of Philadelphia. Brescia, an inland city of immense strength, was besieged by the Milanese. Upon Lake Garda near it were the fleets of the besieging forces. About a hundred miles distant was Venice, apparently unable to cope with the problem of relieving Brescia. An engineer named Sorbolo proposed to the Doge and Senate to take a fleet of war ships up the Adige to the limit of navigation and thence to transport them overland to Lake Garda. By exhibiting a model of his proposed apparatus, he succeeded in inducing them to try his project. A fleet of two first-class and four second-class galleys and of twenty-five light barques was prepared, armed, and provisioned. They were taken up the Adige against its impetuous current until the point nearest the lake was reached. Here they were placed on cradles while afloat, and by the power of a regiment of oxen were drawn up the incline to the plain. Six hundred oxen were required to effect this for each galley, but once on the level half that number could draw the largest ship. The ground was frozen hard, and for thirty miles was level, and the galleys were drawn in an imposing procession by nearly three thousand oxen over the thirty miles until Mount Pineda was reached. The army accompanying the ships were provided with tools, crowbars, shovels, and the like, so as to remove obstructions. When Mount Pineda was reached, a roadway was made over it, and by windlasses the ships were hauled up on one side and lowered down the other, only one coming to grief. As they ascended they were wedged foot by foot to prevent an escape. On the descent the one unfortunate vessel broke loose and was dasned to pieces. The other vessels accomplished the descent in safety and crossed the remaining space of 12 miles, and in February, 1439, the entire fleet was afloat on the waters of Lake Garda. A second fleet was successfully sent there by the same route a year later. The work was done under the superintendence of Sorbolo, the originator of the scheme.

The vessels were of no inconsiderable size. The largest were nearly 150 feet long and about 40 feet wide. The success of such an operation before the days of steam and railroads is an augury for the success of ship railways. In the four and a half centuries that have elapsed since then, the size of ships has not increased so rapidly as have the resources at the disposal of engineers for their land transportation.

THE CELESTIAL WORLD.

A NOTEWORTHY COLLECTION OF PLANETS AND STARS NOW VISIBLE.—Four planets and four bright stars may now be seen near the ecliptic or sun's path in the heavens, the broad curve almost spanning the sky. The planets are Jupiter, Mars, Uranus, and Saturn. The stars are Antares, Beta Scorpii, Spica, and Regulus. Observers may easily trace these shining mysteries for themselves on clear, starlit nights, for they are all, with the exception of Uranus, easy to find, and, when once found, will be a source of satisfaction to those who have learned their names and traced out their position in the heavens. They will appear to rise about four minutes earlier every night, on account of the earth's motion in her orbit, so that by the middle of May the starry circlet may be seen as soon as it is dark enough for the stars to come out.

An observer who would see the celestial exhibition must command an unobstructed view of the sky from the southeast to the northwest horizon. If he commences his observations about the middle of April, at half-past nine o'clock in the evening on a clear night, he will find a radiant star looming above the southeastern horizon. This is Jupiter, the prince of planets, the largest and brightest of the 3,000 stars visible in the firmament. He will be closely followed by a red star, Antares, the leading brilliant of Scorpio, while near on the northwest shines a yellow star of the second magnitude known as Beta Scorpii. Jupiter, Antares, and Beta Scorpii form a group of surpassing brilliancy.

If now the observer glance to the northwest of the first group, near the meridian, he will see a large white star with a silvery tint. This is Spica, the leading brilliant of Virgo, while northwest of Spica and near to it gleams the red planet Mars, superb in tone, tint, and martial aspect, having just passed opposition. A practiced eye will be required to detect the planet Uranus about 4° west of Mars and 1° southwest of Theta Virginis. Uranus shines as a star of the sixth magnitude, and is barely visible to the naked eye. A telescope will quickly bring him to view as a tiny sphere of a delicate green tint.

If the eye be turned still farther to the northwest, beyond the meridian, Regulus will be seen, the next star in the curve or arc and close to the ecliptic. He will readily be recognized as the bright star in the handle of the Sickle.

The planet Saturn forms the eighth and last star in the curve. He is the first bright star northwest of Regulus, shining with a soft, serene light that distinguishes him from a fixed star, and following in the wake of the twin stars Castor and Pollux, who are still farther northwest. Saturn will set in the middle of the month about half past 1 o'clock in the morning, and until that time the eight stars and planets will remain an unbroken curve. The order of observation may be reversed, beginning with Saturn and ending with Antares. The fixed stars apparently never change their places. The planets are always on the move, thus adding variety to the celestial pictures that on clear nights reward the upturned gaze. Planets and stars retain the same order during April, but in May a change comes, Mars overtakes and passes Uranus, and Jupiter overtakes and passes Beta Scorpii, almost grazing the star as he passes. The following is the order of position of the eight planets and stars that shine like golden beads on and near the ecliptic: Antares, Jupiter, Beta Scorpii, Spica, Mars, Uranus, Regulus, and Saturn.

THE OPPOSITION OF MARS.—On the 11th of April, at 1 o'clock in the morning, Mars is in opposition with the sun, "opposite" to him in the heavens, rising at sunset, and is in a straight line with the earth and sun, the earth being in the middle. The epoch is most interesting to terrestrial observers, for, if anything of importance is learned about our brother planet, the discovery will probably be made when he is in opposition, or nearest to the earth. These epochs in Martian history do not occur as often as might be desired, for 780 days, or 2 years and 50 days, must elapse before Mars, having passed one opposition, comes round to another, and 15 years must intervene between the oppositions when Mars is seen under the most favorable conditions. The opposition of 1877 will long be memorable for the discovery of the two tiny moons of Mars, made by Professor Hall with the Washington telescope, at that time one of the largest refractors in the world.

An opposition under similar favorable conditions will occur in 1892, when Mars may be said to have completed a 15 year cycle, and come round to a point where he is about as near to us as possible, or 35,000,000 miles distant. The ellipticity of the orbits of the earth and Mars accounts for the varying distance of the planets at different oppositions. The earth's orbit is only slightly elliptical, but the orbit of Mars is more elliptical than that of any of the planets excepting Mercury. It will readily be seen that when the earth is at or near aphelion, or the greatest distance from the sun, and Mars, at the same time, is at or near perihelion, or the least distance from the sun, the planets will be at their nearest point of approach. This combination of aspects occurs at the end of every 15 years, and the year 1892 will bring our ruddy neighbor to view under the best conditions for terrestrial observation.

Meantime the opposition of 1888, if not the best, is better than that of 1886. Mars is near enough for us to see his moons, his divisions of land and water, the clouds that float in his atmosphere, his snowy pole, his curious double canals, and bright spots.

A somewhat startling coincidence has been noticed by a correspondent of *L'Astronomie* between the Martian canals and the lunar circle of Plato. The writer says a marked resemblance exists between the drawing of the canals of Mars made by Schiaparelli, of Milan, and the drawings of the lunar circle of Plato made by Stanley Williams, of England. The mysterious duplication of the canals is almost exactly reproduced, as well as the brilliant spots that have so puzzled astronomers. If farther investigation confirms this observation, it is possible that the inhabitants of this planet may watch the progress of inevitable decay on our smaller outside neighbor, as well as the progress of development on Jupiter, the giant of the system, before the period of terrestrial culmination has passed, and the earth's cooling process has perceptibly advanced. Mars in decadence, Jupiter in development, and the earth in the perfection of animate life are but three phases of the physical history of the material universe. We trust the great eye of the Lick telescope will scan the round, red face of the planet Mars at the present opposition, and win immortal fame by solving the problem of the double canals and bright spots; or, at least, discovering a couple of satellites.

The Human Breath.

Professor Brown-Sequard has recently been making experiments to determine whether the human breath was capable of producing any poisonous effects. From the condensed watery vapor of the expired air he obtained a poisonous liquid, which, when injected under the skin of rabbits, produced almost immediate death. He ascertained that this poison was an alkaloid, and not a microbe. The rabbits thus injected died without convulsions, the heart and large blood vessels being engorged with blood. Brown-Sequard considers it fully proved that the expired air, both of man and animals, contains a volatile poisonous principle which is much more deleterious than carbonic acid.

SQUIRE WHIPPLE, the well known civil engineer and authority on iron bridge construction, died on the 15th of March, at his residence in Albany, after a brief illness, in the 84th year of his age.

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PHOTOGRAPHIC NOTES.

Brownish Purple Colored Blue Prints.—The paper is floated on a bath until it lies quite flat, made as follows:

No. 1.

Water	2 oz.
Red prussiate of potash	120 grains.

No. 2.

Water	2 oz.
Ammonio-citrate of iron	140 grains.

When dissolved mix the two solutions and filter into a clean bottle.

After draining slightly, hang up to dry, and then preserve paper in a tin case, so that it will be kept free from dampness.

The process of sensitizing and drying should be carried on in a dark place. The paper is now printed upon in the printing frame in the usual way, but somewhat longer and deeper than is ordinarily done. It is then washed well in water and put into the following bath:

Tannic acid	20 grains.
Hydrochloric acid	3 drops.
Water	1 oz.

and kept there for a few minutes. It is next well rinsed in water and treated to a solution composed of:

Water	2 oz.
Saturated solution of potash	10 drops.

which turns the print to a rusty red color all over.

It is again rinsed well in water and immersed a few moments in a bath made of:

Water	1 oz.
Hydrochloric acid	1 drop.

which transforms the red tone to a desirable brownish purple color. After a brief wash in water, the print is dried.

The details of the process were given by J. M. Craith, M.D., to the *British Journal of Photography.*

To Prepare Ruby Colored Glass.—We find reported in the *American Journal of Photography* the following formula given by Mr. Bell before a meeting of the Philadelphia Photographic Society:

Dissolve in

Water	6 oz.
Heinrich's gelatine	150 grains.
Chloride of ammonium	3 grains.

To the above solution is added the following solution:

Water	½ oz.
Nitrate of silver	30 grains.

The new soluion thus made is warmed to a temperature of 100° F., and flowed on a glass plate, previously warmed. One ounce is sufficient to cover a 10 by 12 plate.

After coating, place the glass on a level marble slab or glass plate to set and dry. When dry expose to sunlight, and the color will change to a beautiful orange ruby exactly suitable for dark room illumination.

Hydrokinone Developer.—J. D. Cooper communicates to the *British Journal of Photography* the following formula:

Hydrokinone	6 grains.
Bromide potassium	1 grain.
Citric acid	½ "
Sulphite sodium (crystals)	20 grains.
Water	1 oz.

The sulphite and other ingredients are first dissolved, then the hydrokinone is added.

An alkali solution of carbonate of soda (crystals) is made, 40 grains of soda to one ounce of water.

Equal quantities of the hydrokinone and soda solutions make up the developer for negatives.

The formula is somewhat strong for films rich in silver. If too much density is produced, the right amount may be obtained by dilution, which will adapt the developer perfectly for the production of opals or lantern slides.

Successful Women.

The number of women of our country who have undertaken and are carrying on business enterprises successfully are not a few, and they are increasing every year.

Of the great number of business women whose names we recall, the following may be mentioned as prominent for their success:

In financial circles Mrs. Hettie Green may be mentioned as one of the most prominent stock operators, and among the largest owners of railroad securities in this city. Her fortune is estimated to be over twenty million dollars. Among the publishers, Mrs. Frank Leslie has proved to be one of the most sagacious and enterprising publishers we have. She is a woman of superior ability and education, and possesses a business capacity equaled by few men. Her good management of her large printing establishment confirms that fact. Mrs. Leslie attends to both the editorial and mechanical departments of her printing establishment, and she is not only very clever for her sex, in all business affairs, but her example in the executive administration of her large establishment might be advantageously followed by a good many successful male publishers in this city who are considered sagacious business men.

The West has a number of successful women cattle raisers. Miss Kitty C. Wilkins is called the cattle queen of Idaho, although she pronounces this a misnomer. While she does own a goodly number of cattle, horses are her specialty. She owns between seven and eight hundred, and she gives it as her experience that horses are much easier to take care of than cattle. They show more intelligence in pawing away the snow to get at the dead grass in the winter, and they bring better prices in the market. Miss Wilkins is twenty-three years of age, and is a fine horsewoman and a good shot. She thinks that life in Idaho is the most delightful in the world.

Mrs. Mary Edna Hill Gray Dow, president of the Dover (New Hampshire) horse car railroad, is the first woman in the world to hold such a position. She owns, it is said, the controlling stock of the road, which she bought up when she found that a syndicate of Boston men was trying to buy. Mrs. Dow, who is forty years of age, is said to be an unusually clever business woman. She is a graduate of the Boston High School, and was at one time teacher of French and German in a Western seminary. She made considerable money by lucky real estate transactions, and she hopes to make much more by the judicious management of her road.

An additional list of women who have been successful or gained fame from their business enterprises might be named, some from their patented inventions, some from raising fruits and vegetables for the markets, others from cultivating flowers, raising poultry, and a great variety of other things which is within a woman's province to do, and which, if followed up industriously, and with woman's pertinacity and knack, might result in a good many silver dollars, if not a fortune.

Long Distance Telephoning.

In considering the progress made in this country during the past ten years in introducing the telephone to commercial uses, an unprecedented development is at once apparent. Taken up in the beginning as an incomplete experiment, a wonderful toy, the telephone has developed into an indispensable adjunct of commercial business. No city or town of prominence is now without its telephone exchange, furnishing a quick and certain means of intercommunication to the business community, and its radial system of suburban lines connecting the surrounding territory with the commercial centers. Thousands of miles of wire connect the busy instruments, and more than a million "Hellos" sound the preludes to as many messages and their consequent replies transmitted daily by means of the telephone. Although of necessity a delicate and sensitive piece of apparatus, the telephone is probably used by one hundred times as many people as any other known electrical appliance. It is one of the wonderful features of the instrument that it has stood so successfully the test of such varied usage. During the earlier years of their introduction, the great and continued demand for telephones and exchange connections necessarily led to the introduction of operating appliances which, although representing the best knowledge of their time, proved inadequate to the growth of the business. Exchanges were built, reached their limits, and were rebuilt many times over in a space of a few years. Still the network of wires and cables increased, until to-day the large exchanges, representing in many respects the aggregations of past years, are clogged with inductive and retarding influences which experience only could have developed, and so labor along performing their local functions under a burden of intricate detail which can by no means be appreciated by the uninitiated.

One by one, however, the many difficulties have been met, and, by patient effort and extending experiments, the remedies have been discovered, until, at last, there have been developed means of providing a perfect telephone service, limited in extent only by the cost of suitable lines and equipment. The pioneer work in this new development has been undertaken by the American Telephone and Telegraph Company, of New York, whose lines now radiate in all directions from New York, reaching Philadelphia, Albany, Troy, New Haven, Springfield, Worcester, Providence, Boston, and all important intermediate points. Their construction has occupied nearly three years, and they represent to-day upward of 15,000 miles of undoubtedly the most perfect lines of electrical conductors in the world. White cedar or Norway pine poles, from 50 to 90 feet long, are erected along the most direct highways, there being between 40 and 50 poles to the mile, according to the character of the country. A No. 6 iron guard wire is first strung between the poles from the iron-bound pin in the top of each. White pine cross-arms each 10½ feet long, and provided with ten pins and insulators, are bolted to the poles, and held firmly in place by iron braces. The line wires are of No. 12 hard drawn copper wire, weighing 170 pounds per mile. Each lot of this wire is specially tested for tensile strength and conductivity before leaving the factory. An expert force of men is employed in stringing the wire and in perfecting all the details of the construction work. The present lines of poles carry from 10 to 80 wires, the full capacity of the heavy lines being estimated at 100. Testing stations are located along the various routes from 30 to 50 miles apart, at each one of which a competent repair man is stationed. Rivers and bays are cabled by heavily insulated and armored conductors, terminating in snug cable houses on the banks. The experience in the operation and maintenance of these lines during the past year has been unprecedented. Days, weeks, and months have passed on a number of the main lines without marking a single interruption. All wires being tested at an early hour each morning, any portion of the system can be reached and repairs made before the opening of business hours. In hail and sleet, wind, rain and floods, the long distance lines have held their own and answered promptly to the call for service. No system of intercommunication heretofore devised has provided so perfect a means for the transaction of business between distant points as the long distance telephone. By means of it, conversation is readily carried on between the parties present at the instruments, and all the benefits of a personal interview are secured without travel or loss of time.

Appreciating the great benefits to be derived from the use of such valuable facilities, the public response to the tender of service has been most gratifying. Representative bankers, brokers, and manufacturers, and even great railway corporations, have found in the long distance telephone a service which has never before been approximated. Great factories are brought into the closest relationship with their city offices. Important business transactions, heretofore requiring hours or days of time, and dozens of telegrams or letters, are concluded definitely and satisfactorily in five minutes' conversation by telephone. It has been said, if we have no haste in our communication, we may write a letter; if a short or direct message only is to be sent, we may telegraph; but now, if we have urgent business to transact, and wish to secure the advantages to be derived only from personal conversation, we may telephone. Here, therefore, is the growing and fruitful field for the perfected service. Successful to-day over many hundreds, who can predict how many thousands of miles shall mark its limitations?—*Electrical Review.*

Life Saving Apparatus for Use at Fires.

A recent fire in this city, at which the life saving devices were employed, did much to prove their inefficacy. A number of the inmates of a burning building were driven by the flames to the windows. As there was no fire escape, but one alternative offered itself, that of jumping to the ground. The scaling ladders were useless on account of the flames issuing from the windows. Several persons took the leap. Some were caught in the life saving nets, but were not thereby saved from injury. The net is perfectly efficacious in catching a human being who leaps from the second story of an ordinary house, provided the jumper is an expert, as well as the men who hold the net. It is here that its weakness is manifest. When an untrained person is the jumper, it seems to be of comparatively little use.

The rush of flames from the windows of a burning house is the worst obstacle the scaling ladder has to contend with. This emphasizes its weak feature. Its operations are limited to the lines of windows. The dead wall of a building, which is secure from the flames, offers also a barrier to the climber. Could the ascent be made there, and could lateral deviations be made, a partial solution of the problem would be secured.

The truth is manifest. Adequate life saving apparatus is not used, and just as certainly would be used were it yet invented. The firemen of the cities of this country are every day performing heroic actions, the more heroic because of the inefficiency of the means at their command for saving life. There is no defect in the *personnel.* It is all in the apparatus. A field for invention is open here. The person who successfully grapples with the problem will be a benefactor of his race. Adequate scaling or ascending apparatus, and adequate devices for catching those who leap from windows, are imperative needs of the life saving service. The present means are not sufficient.

The Professional Inventor.

Under the heading of "A Hint to Inventors," the facetious editor of *Texas Siftings* gives the following dialogue, which is, in a measure, characteristic of a class of inventors:

First Yankee: "What puts you in such a good humor this morning?" Second Yankee: "I've just got my patent for my new patent ink eraser. I wouldn't take $50,000 for it." "Did you get a patent last year for inventing an indelible ink?" "I did, and I sold it for $30,000, and now I've invented an eraser that will even remove writing done with my own indelible ink." "What are you going at next?" "I'm going to invent another indelible ink that can't be erased with my new ink eraser. I tell you, there is money in this patent business if you go at it right."

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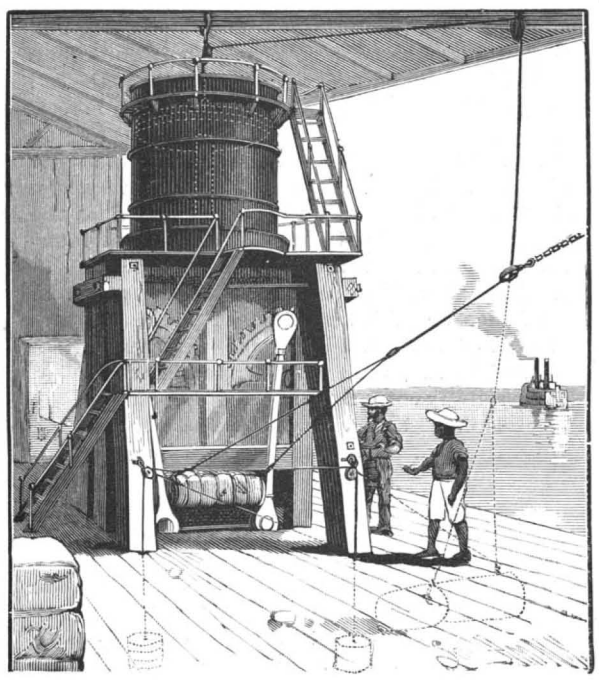
A BALE EJECTING ATTACHMENT FOR PRESSES.

An invention providing means whereby, at the proper time in the operation of the press, the compressed bale will be withdrawn, is illustrated herewith, and has been patented by Mr. George Calder, of Vicksburg, Miss. In the compress shown, the platen rises toward and falls from a stationary head block, while to the moving piston is attached a wire rope, chain, or other suitable connection, extending through blocks or rollers to suitable bale engaging hooks. These hooks are forced into the bale before the piston returns downwardly to withdraw the platen, by which operation the spreading hooked lines with the engaged bale



CALDER'S BALE EJECTOR FOR PRESSES.

are drawn outwardly and upwardly from the press, by which means weighted lines also connected with the bale hooks are likewise drawn up, the hooks being removed from the discharged bale by the weighted line connections. The distance of the withdrawal of the bale from the compress is readily regulated by the arrangement of the blocks or guides, and the length of line, the attachment providing for materially increasing the work of the compress.

THE CITY OF NEW YORK.

On March 15, there was launched, on the Clyde, the splendid twin screw steamship City of New York, the first of the two liners now being built by Messrs. James and George Thomson for the Inman and International Company, plying between New York and Liverpool. The Inman Company is well known to Atlantic travelers as providing in their floating "cities" a safe and comfortable means of transit across the Atlantic, and, next to the Cunard, it is the oldest Atlantic steamship company.

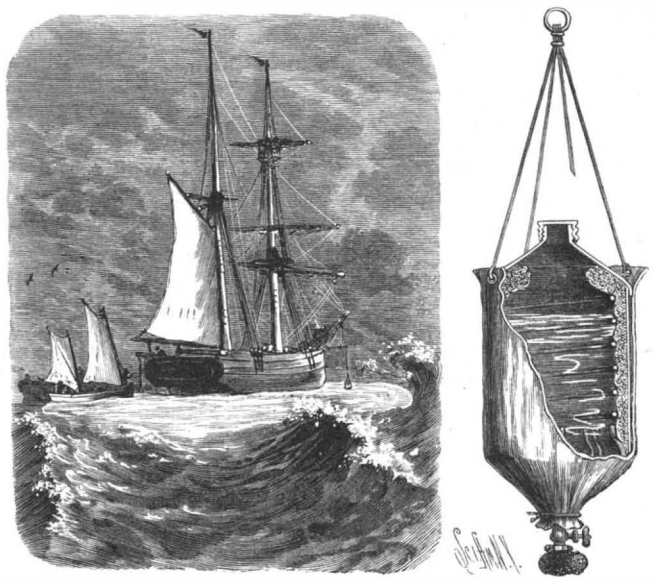
For some years, however, it retired from the struggle for pre-eminence, at least so far as speed is concerned; but now, after the reconstruction of the company, about a year ago, under the title of the Inman and International Company, it is coming to the front again by building two splendid steamers, with the view of trying conclusions with the present "greyhounds" of the Atlantic. It is expected that the speed of these vessels will be at least as great as the fastest liners now afloat, but at the same time speed is by no means the first consideration which the directors of the company have kept before them, the two paramount considerations being the safety and comfort of the traveling public.

The general appearance of the ships is well indicated by the illustration which we are enabled to give at the foot of this page, and which shows to advantage their smart, yacht-like form, with three masts and three funnels, which will before long be well known to seamen on the Atlantic. The length of the City of New York is 560 feet, the breadth 63¼ feet, and the depth to upper deck 43¼ feet. Above this upper deck, however, is a promenade deck, supported on stanchions, and affording a promenade which is uninterrupted for the whole length of the ship. The most important structural feature in these ships is the thoroughness of the system of water tight subdivision which has been adopted. There are fifteen main water tight compartments separated by steel bulkheads extending from the keel to the upper deck, or to a height of 16 feet above the water line. Two of these compartments could be knocked into one and flooded by the sea without rendering the vessel unseaworthy. Of these fifteen compartments three are devoted to the boilers, which are thus separated into three independent groups. Two other compartments are occupied by the two sets of triple expansion engines, which are also entirely independent, so that if any breakdown were to occur at any time to either of the engines or screw shafts, the ship could still proceed at about three-quarters full speed. The advantages of this duplication of the machinery are so obvious that it is surprising it has not been adopted before this in any of our large Atlantic liners, and there can be little doubt that the Inman and International Company will reap the reward of their enterprise in being the first to provide the additional security of twin screws.

The main saloon is constructed on a principle patented by the builders, which was first carried out in the National liner America, recently sold to the Italian government. The central part of the saloon is of a dome-like shape, and rises in a graceful arch to a height of 22 feet above the floor, thus giving an air of spaciousness which has never before been attained on shipboard. The drawing room and library are also spacious apartments, and will be fitted in a style of luxurious comfort. An important feature in these ships is the hydraulic system, which is being fitted by Messrs. Brown & Brothers, of Edinburgh, and which entirely takes the place of steam for such duties as steering, warping, heaving the anchors, loading and unloading cargo, hoisting ashes, etc. The rudder and steering gear is specially designed to be entirely below the water, so as to be efficiently protected in the event of the ships being employed as armed cruisers. The cargo will be worked by 12 hydraulic derricks, which will discharge and take in cargo with great dispatch and an absence of noise, and which will be appreciated by both passengers and officers. From the foregoing description it will be seen that the launch of the City of New York marks an important step in the continuous effort to overcome the dangers and discomforts of the stormy Atlantic voyage, and the performances of this new "greyhound" will no doubt create considerable interest during the coming season among all classes of the shipping community.—*Industries.*

A DEVICE FOR QUIETING WAVES IN STORMS.

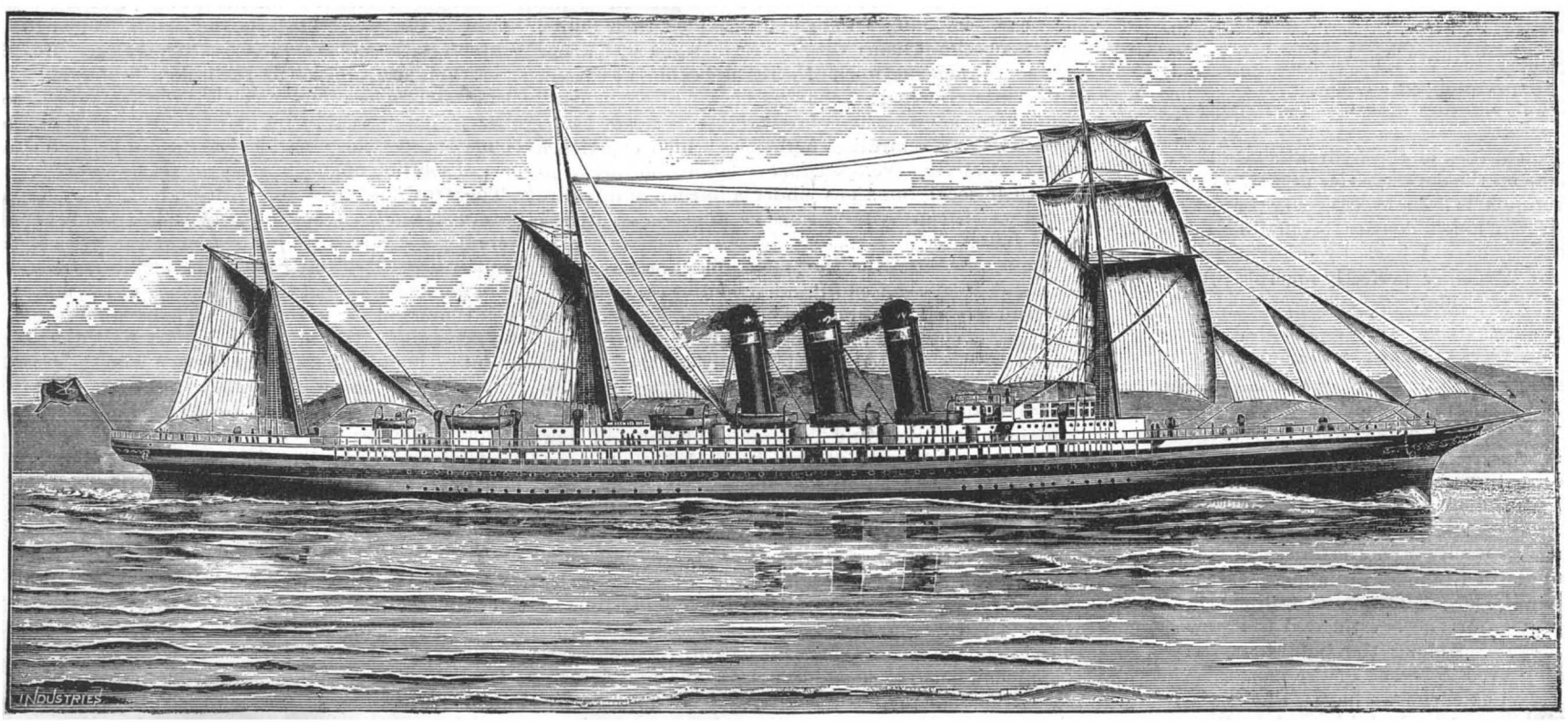
An oil distributing device for seagoing vessels, whereby the waves may be quieted by the distribution of oil in or on the surface of the water, is illustrated herewith, and has been patented by Mr. Jonathan I. Hazard, of Georgetown, S. C. It consists of a can to be suitably suspended by cords, the can being clothed externally with a protecting canvas or flexible wrapper, and having internally a body lining supported by a coiled wire, in connection with a suitable soft and absorbent material, for the retention of the oil and as a protection to the can. Passing through a diaphragm near the lower end of the can, and out through the bottom, is a pipe fitted with a valve, for regulating the amount of oil to be discharged, there being at the outer end of the pipe a strainer or sieve, to make the distribution of oil more general or diffused, although this strainer may be swung back and a small extension pipe screwed into the valvular nozzle to distribute the oil in a more or less fine stream.



HAZARD'S OIL DISTRIBUTING DEVICE FOR VESSELS.

The Manufacture of Steel.

A well known engineer says, in one of our contemporaries, that: "In the manufacture of steel, nothing very new has come to the surface during the last year. Two establishments have fitted themselves up for using the basic process—one at Pottstown, Pa., the other at Homestead, Pa. The Pottstown establishment uses the Bessemer process, while at Homestead open hearth furnaces are used. The developments have not gone far enough to announce results. Great progress has been made in the manufacture of steel castings. The process under which all successful makers now work was developed at Terre-



THE NEW STEAMSHIP CITY OF NEW YORK—10,500 TONS, 560 FEET LENGTH.

noire, France, some ten years ago. American manufacturers have applied their usual ingenuity, and now we may say we can produce as good steel castings as Europe. Rolls weighing nearly 50,000 pounds and anvil block weighing 66,000 pounds, at Cleveland, Ohio, show what can be done in entire blocks."

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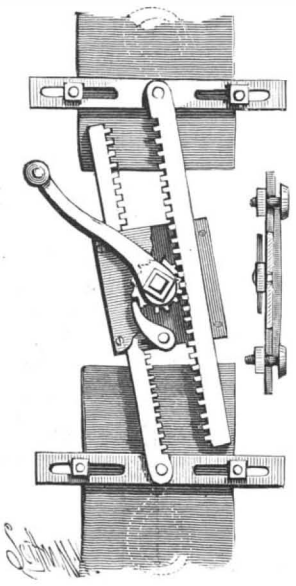
AN IMPROVED BELT TIGHTENER.

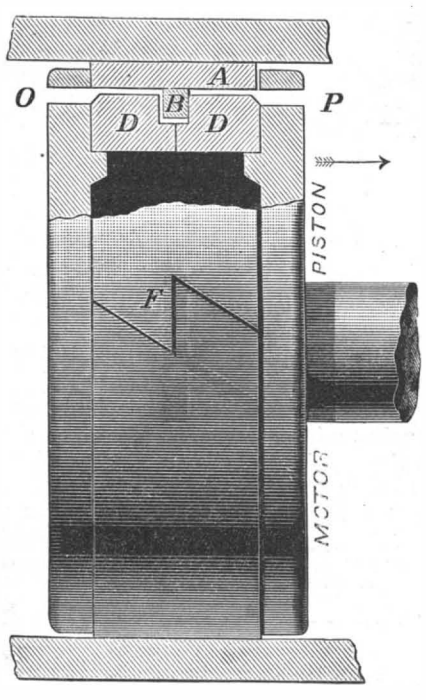
A simple and easily operated device for stretching a belt while on the pulleys, and holding it stretched while the operator cuts out a portion and relaces the ends to shorten the belt, is illustrated herewith, and has been patented by Mr. Dock Bowman, of Cynthiana, Ky. In an open ended casing is mounted a shaft carrying a gear wheel, with racks meshing into it, and cross bars pivotally connected with the racks, the cross bars being adapted to be secured to the belt to be tightened. By turning th crank arm on the shaft, the racks are moved toward each other in opposite directions, pulling the cross bars toward each other, and thus stretching the belt, the belt being held in taut position by a pawl, which locks the shaft until the operator cuts out part of the loose portion of the belt between the cross bars and relaces the ends. If it is desired to use the tightener on chain belts, the cross bars are provided with a hook, shown in dotted lines, which can be inserted into the links of the chain.



BOWMAN'S BELT TIGHTENER.

AN IMPROVED BALANCE PISTON RING PACKING.

A piston ring packing made on the theory that a certain amount of the fluid under pressure creeps in between the ring and cylinder is illustrated herewith, and has been patented by Mr. James Brandon, of No. 390 Eleventh Avenue, New York City. The engraving represents a piston partly in section, in which A is the main packing ring, cut for expansion, and made to break joint at F. D D may be regarded as part of the body of the piston, made in two parts as shown; or in one part, or solid with the piston heads, as may seem most advisable. In putting the rings in old pistons, the part, D D, is made to fit nicely over the lugs of the spider, being clamped by the follower. B is a small ring fitted in the groove in the central part of the body of the piston, D D. The ring, B, is cut for expansion, and made to break joint in the usual way. It is made to bear against the outer ring, A, the same as a packing ring bears against the cylinder. O and P represent two of the several holes in the flanges as shown. Assume the piston is moving forward, as from left to right in the engraving, and that it is used for a steam engine, the outer ring, A, will take the position in which it is shown. The steam pressure being behind the piston will pass through the holes, O, between the ring, A, and body, D, forcing ring, B, against the forward side of the groove in D D. It may be seen that the pressure of the steam, forcing the ring radially against the cylinder, is limited to that of the inside surface of ring, B, and that part of ring, A, lying between ring, B, and the rear flange of piston, leaving that part of ring, A, lying between ring, B, and the front flange of piston relieved from the internal pressure. Assume the piston



BRANDON'S BALANCE PISTON RING PACKING.

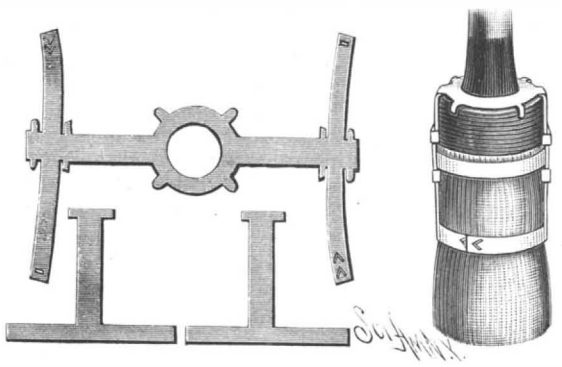
is used for a pump. Then as the pressure is in front of the piston, it will pass through the holes, P, or between the front flange and the ring, A, forcing the small ring, B, against the rear side of the groove in D D. Now it may be seen that when it is used for a forcing piston, the pressure on the inside of the ring forcing it to the cylinder is limited to that of the inside surface of ring A lying between B and the front flange of the piston, leaving that part of ring A lying between B and the rear flange of piston relieved of internal pressure through holes, O. The ring, A, is fitted in the usual way, between the flanges of the piston, and B in the groove, the spaces on the side being left open so as to more easily understand the working, from the engraving. The construction is not limited to that shown, which is intended to explain the principle involved. The aim is to provide a piston that shall be self-packing against pressure, but in which the pressure shall be so balanced as to permit neither the forcing the rings outwardly so hard as to rapidly wear out the rings and cylinder nor forcing them inwardly so as to permit the fluid to pass by them.

The Wild Horses of Nevada.

Nevada horse raisers and ranchmen on the Pioche and White Pine ranges are complaining of the wild horses of that region. In the Shellback Mountains are bands of from 150 to 200 of these horses, each under the leadership of powerful stallions, and they make regular raids on the ranches and run off the horses of the ranchmen. A horse once gone is gone forever, the Nevada men say, for the wild horses are cunning and wary, and will not let a man get within rifle shot of them. Last spring fifteen experienced horsemen and hunters started out with the object of killing as many of the "boss stallions" as possible. In a ten days' hunt they managed to kill just one horse. The wild horse of Nevada is said to be about the most ugly beast alive.

A CLAMP OR BRIDLE FOR PAINT BRUSHES.

A simple and easily applied brush clamp, the members of which can be readily struck up and fitted to their places, no springs being necessary to engage the adjusting sections, has been patented by Mr. Aaron B. Kistler, of Aquashicola, Pa., and is illustrated herewith, together with face views of certain blanks of



KISTLER'S PAINT BRUSH BRIDLE.

which the clamp is composed, before being bent and fitted to their places. The clamp consists of three main portions, all made of sheet metal, one piece having a central apertured head which fits over the handle of the brush, arms projecting from opposite sides of this head and being bent downward over the sides of the brush, the outer ends of the arms having crossing band strips which are bent round the bristles and engaged with one another by cut-out lips or hooks and eyes. Adjustable sections and binding bands are also adapted to be bent around the bristles, and engaged in position in like manner, whereby the whole device lies flat on or against the brush, offering no obstruction to its use on all sides, these clamps being equally adapted for use with new or old brushes, and suitable for brushes with different lengths of bristles.

A Rat Plague in China.

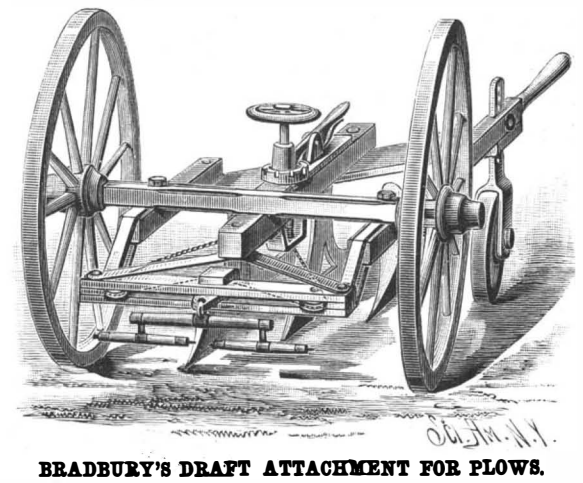
Almost every newspaper from Australia has something to say about the rabbit plague in that colony.

The SCIENTIFIC AMERICAN of Dec. 24, last year, contained a report from the Department of Mines, Sydney, New South Wales, detailing the extraordinary destruction caused by rabbits in that colony, and accompanied with the offer of £25,000 sterling as a reward to any person who would contrive a method for their extermination.

And now comes a similar wail from China, stating a danger which threatens that empire. A recent number of the Pekin *Gazette* contains a memorial to the Emperor from the Governor of Uliassutai stating that, owing to the appearance of swarms of rats, it has been found necessary to alter the routes of the government courier service in three of the postal stations in the Khalkha region in Outer Mongolia. For two years past the pasturage of the districts in question has suffered severely from the ravages of these vermin, and last year nearly every blade of grass was eaten up. The whole country has been honeycombed with their burrows, the horses and camels are in a famishing state, and there is no means of keeping them alive. The burrows are a source of great danger to the mounted couriers, and the want of forage renders it impossible to maintain a supply of animals for the service.

AN IMPROVED DRAFT ATTACHMENT FOR PLOWS.

A draft attachment more especially designed for use with gang plows and other agricultural implements or machines, to allow the draft of the animals to be adjusted laterally to accommodate the work, is illustrated herewith, and has been patented by Mr. Heber E. Bradbury, of Beaumont, Cal. On the front of the side timbers of the frame are downwardly bent iron straps, between which are held the opposite ends of a draft bar, formed preferably of two metal plates, held apart to accommodate a draft block which may be shifted laterally either way, pulleys being also journaled near opposite ends of the draft bar, and braces extending

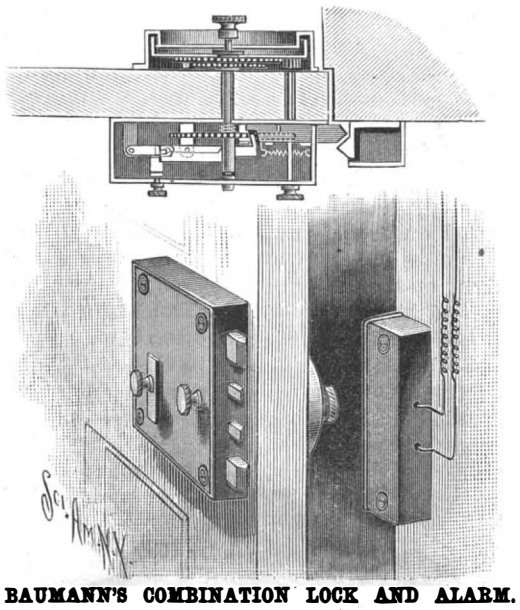


BRADBURY'S DRAFT ATTACHMENT FOR PLOWS.

therefrom to a center bar of the frame. Chains connected to opposite sides of the draft block pass around the pulleys near the ends of the draft bar, and their rear ends are wound in reverse directions on the lower end of a vertical shaft journaled in the plow frame. To this shaft, above the frame, is fixed a catch plate having radial notches, with which a spring-actuated latch lever is pivoted to engage. By turning this shaft in one direction, by its hand wheel, when the latch lever is disengaged from the catch plate, the draft block will be moved toward one end of the draft bar, and by turning the shaft in the other direction the draft block will be moved the contrary way. The draft block, to the forwardly projecting end of which the double-tree is connected by a link, is preferably made of metal, the single-trees being coupled to the double-tree, while the shifting of the block is readily accomplished without unhitching the horses.

A COMBINATION LOCK AND ALARM.

A lock provided with means for being readily set to a great number of different combinations, and connected with an electric alarm, which connection may also be used with an electric light or signal light, has been patented by Mr. Robert Baumann, of No. 733 South Seventh Street, St. Louis, Mo., and is illustrated herewith, one view being in section. Through the inner and outer casings of the lock, secured to the inside and outside of the door, extends a horizontal shaft, provided on its outer end with a knob extending a short distance beyond a recess in the front casing, and on a square part of the shaft is held a collar rotating a wheel on which are marked numerals from 1 to 100, one of the numerals appearing at a time through an aperture in the rim of the outer casing. The shaft, which is adapted to turn and slide in its bearings, has a radial arm engaging a lug on a vertical lever, a spring arm being operated on by the vertical lever and a bell crank lever held in locked position by the outer end of the spring arm, a locking plate being pivotally connected with the bell crank lever, while there are spring plates adapted to be connected with a battery



BAUMANN'S COMBINATION LOCK AND ALARM.

and an alarm. When a person desires to enter the door without knowing the combination at which the lock has been set, he can neither by sound nor sight determine the relative positions of the parts of the lock, and will consequently be unable to open the door.

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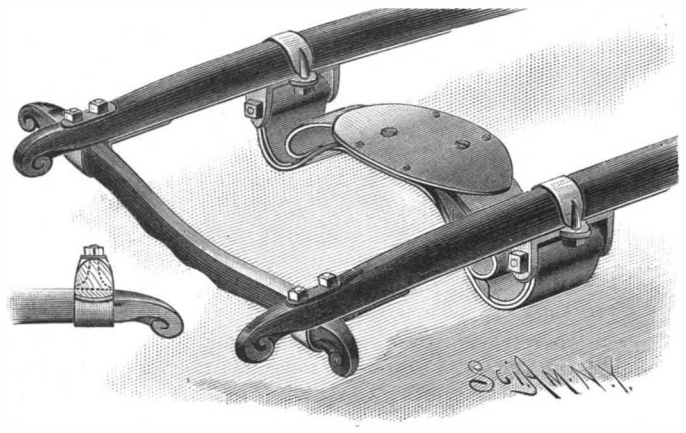
IMPROVED SPRING FOR SIDE BAR VEHICLES.

A spring of novel construction, readily attached to the platform of a vehicle and to the side bars, and designed to give to the body a regular, easy, and pleasing movement, is illustrated herewith, and has been patented by Mr. Edward Hutchinson, of No. 239 East Fifty-first Street, New York City. The front, end, and side bars are united by clips of peculiar construction, having a horizontal lip integral with the outer surface of the inner member, to sustain the outer ends of horizontal springs, conforming to the under surface of the side bars, and extending from a bearing upon the lips, in contact with the side bars, to a point near the center thereof. These springs are made of thin steel, and in connection therewith, at each side of the center of the two side bars, ears are secured having lugs supporting springs with overlapping curved leaves, there being about centrally of the two leaves apertured oval binding plates, so arranged that when weight is brought to

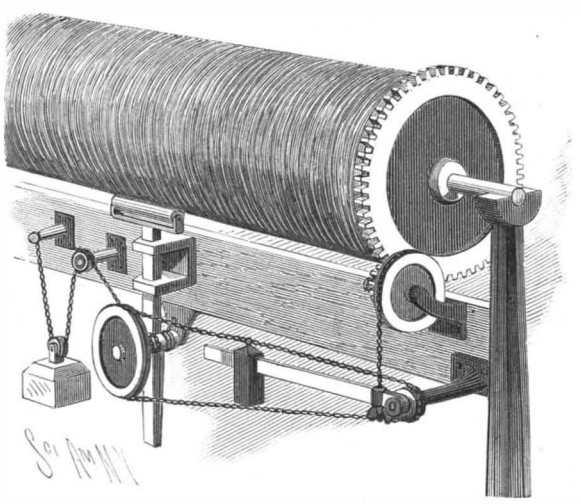


HUTCHINSON'S SPRING FOR SIDE BAR VEHICLES.

bear upon the springs the leaves work in opposite directions, the spring action taking place near the ends only, the central portion being bound by the elliptical plates. The body of the vehicle is connected with the spring through a block, which has its under face concaved to correspond with the convexity of the upper binding plate, such attachment being easily and expeditiously accomplished.

AN IMPROVED TENSION DEVICE FOR LOOMS.

A device whereby, in weaving, as the warp is drawn off from the warp beam, and the diameter of the roll is



BAILEY'S TENSION DEVICE FOR LOOMS.

diminished, the tension will remain constant, is illustrated herewith, and has been patented by Mr. Chester Bailey, of Janesville, Wis. A vertically arranged follower, held loosely in guides attached to the cross piece of the loom frame, carries a roller held in constant contact with the roll of warp by a weight acting upon the follower bar through a cord, to which it is connected through a drum, to which the follower bar is also connected. On this drum is a gear or chain wheel, over which, and over a small chain or cog wheel journaled on a shaft near one standard of the loom frame, passes a chain attached to a weight placed loosely upon a pressure or tension lever fulcrumed at the axis of the small chain wheel, and supported by a band passing over a friction drum held on a shaft journaled in brackets attached to the cross piece of the loom frame. On this shaft is also a small gear wheel running in contact with a large gear wheel on the end of the warp beam, so that as the latter is turned by the drawing off of the warp the friction drum is turned, retarded by the band acting thereon as a brake, the band being drawn down by the tension lever and weight. The latter is automatically moved toward the fulcrum of the lever as the diameter of the roll of warp diminishes, so that the friction will gradually diminish, thus maintaining a uniform tension. The movement of the weight upon the tension lever is effected by the gradual lifting of the vertically arranged follower bar as the diameter of the warp upon the beam diminishes, through its action on the connected drum and chain wheel.

Australian Rabbits and Pasteur.

The Australian authorities are not at all enthusiastic over M. Pasteur's bacteriological method for the extermination of rabbits. They have already forbidden, under considerable penalties, the importation of any rabbit affected with any disease, for use in destroying the too numerous Australian rodents. The favor with which M. Pasteur's delegates, charged with exterminating the troublesome guests, will be received, is doubtful. The reasons of the Australians are serious ones. Here, they say, is a microbe which quickly kills two domestic animals of different nature, rabbits and chickens. In propagating it, are we not in danger of making Australia fatal to gallinaceous life? And on the other hand, what assurance have we that this same microbe will not do serious injury to sheep, cattle, horses, etc., and perhaps even to men? On this point, the records are defective. We hope M. Pasteur will succeed in answering categorically as to the innocuousness of chicken cholera microbes as regards domestic animals. There is yet another point. Admitting that the experiment is tried, and that the microbe is disseminated through Australia, and is without effect on cattle or man, can we be certain that in the new conditions the microbe will not acquire the particular properties which will make it injurious to animals hitherto exempt? Evidently not. We can understand the scruples of the authorities who hesitate about releasing upon the whole country a most active microbe over which man will have no efficient and certain control, once the experiment has begun.—*Revue Scientifique.*

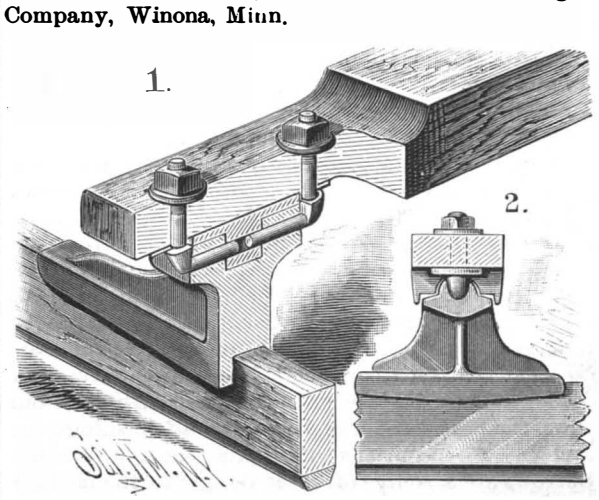
The Testing of Materials for Mortar.

In the eleventh annual report of the executive board of the city of Rochester, N. Y., appears a special report on cement mortars for use in public work. Professor Charles D. Marx and Alfred M. Mosscrop, of Cornell University, did much of the experimental work, and their investigations show a decided advance in this line of research.

In addition to the usual tests of strength by breaking briquettes, the sand was tested to determine its "voids." The ground was taken that sand whose grains lie close together, presenting a minimum of voids, is the best for making mortar and cement. The method of testing was to ram dry sand into a graduated cylinder, and then to introduce by siphonage enough water to flood its upper surface. The volume of water gave the amount of voids. Cements were tested in the same way, but in this case, by a suggestion of Prof. Fuentes, coal oil was used as the liquid. The general deduction from the tests was that the larger the amount of fine material, the worse the sand for mortar. Yet a certain amount, not exceeding twenty per cent of fine siliceous matter, may be admissible.

AN IMPROVED SLEIGH KNEE.

A simple and efficient device for connecting the runners to the beams of sleighs, designed to allow a limited vertical and lateral play of the runner, without overstraining it or the beam or reach, has been patented by Mr. James F. Hennessy, of Winona, Minn., and is illustrated herewith, Fig. 1 showing a transverse vertical section and Fig. 2 a side elevation. At its top part the knee has two half-rounded lugs, between which and transversely of the knee is a recess adapted to receive a lug formed at the center of a cap plate. The pivot bolts have a right-angular general form, their lower horizontal parts passing rather loosely through the knee lugs, and into the cap lug from opposite sides of the knee. With this form of construction, but two bolts are required to hold each knee and cap to the runner and beam, and the sleigh can be shipped in knockdown condition, or its parts may be readily dismembered for making repairs, by simply unscrewing the two nuts conveniently accessible at the top of the sleigh beam. For further information relative to this invention, address the Winona Wagon Company, Winona, Minn.



HENNESSY'S SLEIGH KNEE.

AN IMPROVED DEVICE FOR RENOVATING GARMENTS.

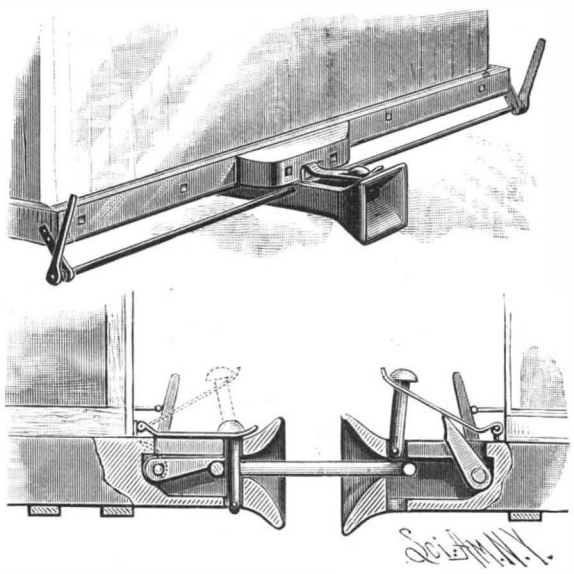
A device whereby the sleeves and shoulders of velvet or other plush garments may be renovated or revived by the application of heat, without ripping or removing the sleeves from the body of the garment, is illustrated herewith, and has been patented by Miss Annie Shanley, of No. 18 East Eleventh Street, New York City. A sleeve-heating shell of metal, preferably covered with asbestos and felt, as shown in the sectional view, is adapted to be attached to a body standard by a ball and socket, and fixed in any desired position in

SHANLEY'S DEVICE FOR RENOVATING GARMENTS.

relation thereto by a set screw. The standard has rounded shoulders to fit the shoulders of a garment, and the sleeve heater has an inner core of metal to be removed from the shell and heated, and then replaced, when the sleeve of the garment to be renovated is drawn upon it and properly manipulated to revive the velvet. Instead of such heating core, a perforated tube may be used, supplying gas to be burned in the interior of the sleeve-heating shell.

AN IMPROVED CAR COUPLING.

A coupler by which the link may be held in proper position to couple cars of varying height, and wherein the pin may be held raised, to couple automatically with an entering link, is illustrated herewith, and has been patented by Mr. Frank B. Wineland, of Breckenridge, Col. Within a recess in the drawhead is mounted a tongue formed with an inclined face, and rigidly connected to a transverse shaft journaled in bearings and extending outward beyond the sides of the car, where it is provided with levers. When a car is to be coupled with another having a higher drawhead, the levers are



WINELAND'S CAR COUPLING.

turned so that the inclined face of the tongue will bear against the inner end of the coupling link, thus elevating its outer end to the proper position, while by withdrawing such pressure the extending end of the link is correspondingly dropped. To set the pin in a position to couple with the link of an approaching car, the levers are turned back, thus raising the tongue until it strikes against a hinged arm, through the slotted end of which the coupling pin is passed, carrying the pin upward to the position shown in full and dotted lines in the sectional views. As the cars come together, and the link of the approaching car enters the drawhead, the lever is thrown forward and the pin allowed to drop, thus effecting the coupling.

A CENTENARIAN PRINTER.—At Mount Jerome Cemetery, Dublin, lately, was buried Pattison Jolly, aged 104, probably the oldest printer in the world. He served his time at Ballantyne's, in Edinburgh, and pulled the first sheet of the *Edinburgh Journal*, over 70 years ago. For half a century he was in Dublin, and for some years carried on the printing business in the house which belonged to Griersons, late Queen's printers.

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Correspondence.

Hot Water for Ivy Poisoning.

To the Editor of the Scientific American:

Let me add my testimony to that of Mr. John Burroughs as to the efficacy of hot water in curing the poison by ivy. The best way of applying it is to keep a spirit lamp under the tin containing the water, and apply the water as hot as the skin will bear. The sensation of relief from the intolerable itching is so immediate and so complete that it is almost worth while to be poisoned by ivy to experience it.

WM. C. CHURCH.

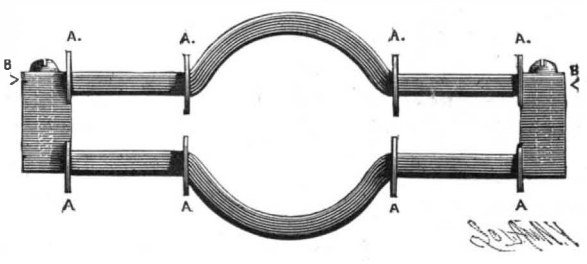
New York, March 29, 1888.

To the Editor of the Scientific American:

Referring to your issue March 17, page 165, "Electric Motor," Fig. 1. Can the field magnet be made of soft cast iron with flanges on, as per draught inclosed? Can the ring, B, of the armature, which is now made of iron wire, be made of soft cast iron?

FRANK M. HARMAN.

[Mr. Harman sends us a diagram of a field magnet of exactly the form illustrated in the article referred to, with flanges added. The article on the small motor was written for the express purpose of assisting amateurs who have few tools and no machinery. If all necessary tools are available, the motor may be modified in several particulars, to facilitate the work of construction, but without securing better final results. We give herewith an engraving of a magnet to be made of cast iron. Instead of being formed of a single casting, it consists of two like halves, both made from the same pattern. The ends, which are made square, are fitted together accurately either by planing or filing, and fastened together by screws or bolts, two at each end. The body of the cast iron field magnet should be fully one-half inch thick, and the ends one inch thick. The flanges, A, which confine the wire as well as the portions of the magnet on which wire is wound, should be covered with thin cloth before winding. The halves of the magnet are wound separately in a lathe, the ends being supported by the centers, B B, as shown.



It is not advisable to make the ring of cast iron. It should be as soft as possible.—EDS.]

Internal Strains of Guns.

To the Editor of the Scientific American:

I notice in your issue of March 24 some very proper statements in regard to the internal strains in the parts of built-up forged steel guns. But the statement, taken from *Engineering*, that the Russian General Kalakoutzky is the only one who has had a proper appreciation of the importance of considering these strains, is not quite accurate.

In 1885 an experiment was made at Watertown Arsenal, Mass., similar to those of General Kalakoutzky, for the purpose of determining the internal strains in the cast iron body for a 10 inch wire-wrapped rifle.

Subsequently similar experiments were made upon steel cylinders, and the character of the strains, as well as the method for eliminating them by annealing after oil tempering, made clear.

Full reports of these experiments were published in the annual Reports of the Chief of Ordnance, U. S. A. for the years 1886* and 1887.†

The methods were shown, by the subsequent publication of the results of General Kalakoutzky's experiments, to have been the same as those used by that officer.

WILLIAM CROZIER, Lieut. of Ordnance, U. S. A., 920 19th St., Washington, D. C., March 28, 1888.

A Typewriter of 1829.

A Washington correspondent of one of our daily papers says that evidence is about to be filed at the United States Patent Office which bids fair to prove that after all there is nothing new under the sun. The certificate is dated 1829, and is signed by Andrew Jackson. The drawings and specifications cover the invention of a typewriter. It is styled a typographer, and the original patent record was destroyed in the Patent Office a dozen years ago. The drawings of the time-stained patent closely resemble the construction of the modern typewriters. The patent was originally taken out by William C. Burt.

* Appendix 27a. † Appendix 38.

The Reis Telephone.

In the recent hearing before the Commissioner of Patents, on motions made by McDonough and Gray to reopen the interference case between those parties and Bell and Edison, decided March 3, 1885, Colonel Ingersoll said: Mr. Commissioner, according to my idea, the first thing to examine or the first point that should be settled, is whether or not the evidence that was before the examiners and the evidence that was before the examiners in chief, and the evidence that is in this motion, absolutely show and establish beyond a reasonable controversy the fact that the Reis telephone, as invented by him, will speak. The importance of that is perfectly manifest from the further fact that McDonough claims an improvement on that system, so that the question is, Will the Reis telephone talk, was it intended to be, and was it, a speaking instrument? When that fact is established, the field is opened for anybody to patent any device connected with the transmission and receiving of speech. It seems to me that there can be no dispute as to that one fact. The invention of Reis was a telephone. He gave it the name. He made it for that purpose, and, according to testimony, he succeeded. He accomplished his object. First, as to whether the Reis telephone will talk. Upon that subject I first call your honor's attention to the affidavit of Professor Nipher, the professor of physics of Washington University, who states without the slightest hesitation that the instrument known as the Reis telephone will speak, that it will transmit articulate speech. He also says that there is no essential difference between the undulatory, pulsatory, and intermittent currents. The operation of the instrument of Reis does not differ in any way from the operation of the modern transmitter now in use.

The fact that Reis made so many different types of instruments containing the same elements which modern practice has shown to be essential is positive proof that he had the art of telephony clearly and correctly in his mind. The transmitters of Reis contain every essential element of the modern transmitter, and there can be no doubt that he constructed the instruments as he says. This man took the Reis instruments that were deposited in the Smithsonian Institution, at Washington, and his affidavit says that when he put them together in exact conformity with the directions of Philip Reis they talked—that articulate speech was transmitted. He simply says that it works. He was speaking through these instruments, words were transmitted, words were received. Can that be said of an instrument ever made by Mr. Bell up to February 14, 1876? Can it be said of any instrument or device made by Mr. Bell, or even drawn by Mr. Bell, up to 1877? It is very much easier for a man to make a machine talk who wants it to talk than for one who puts up a machine and adjusts it, having in his mind the firmly fixed prejudice that it is deaf and dumb. In spite of himself he will work for the corroboration of his theory, for the justification of his prejudice. You know as well as I that the instruments at that time—1861 and 1862, or in 1864—were extremely crude, and what the parts lacked in mechanical nicety had to be compensated for by precision of adjustment.

The Commissioner: I understand the other side to say they think that there are, now and then, certain conditions that make the instrument equivalent to a microphone, and that a word would escape the Reis invention.

Mr. Ingersoll: I understand that point, and it is the easiest thing to destroy that little rampart of nonsense that has been put in front of the Bell invention. Everybody will admit—everybody in the world, including the gentlemen on the other side—that the office of the receiver is to reproduce what has been produced. Now, if the transmitter invented by Reis will not so affect the electrical condition of the wire, or, to use other language, will not impress voice waves or sound waves upon the current of electricity, then no receiver could give out human speech, because the receiver can only take what is given it; and unless the invention is such that it sends the composite wave, that is to say, a wave representing a pitch or quality, tone or form, the receiver cannot take and reproduce such a wave. I will show before I get through, even by Mr. Cross, that this transmitter of Reis will convey speech to the receiver invented by McDonough, and will itself give articulate speech to the listener at the receiving end. I do not believe the history of the world will give such a record of intellectual impudence as this case. They stand now before you, and without changing complexion say that Reis made a stumble; that he did not know what he was doing; that all he did was to stub his toe upon a hidden fact in nature; that his only intention was to produce and reproduce musical tone. That was all, and yet Reis himself says he labored with a view to producing the total actions of all the organs apparent in human speech. Suppose, gentlemen, that had been in Bell's fifth claim, how easy, how much easier, the task would have been! You cannot, from his patent of March 7, 1876, show, you cannot raise a suspicion, that he had a speaking telephone in his brain, and I hope to show before I get through that he didn't. But suppose these words had been there: "I propose at one time to produce the total action of all organs apparent in human speech, my object being to convey speech at a great distance by means of electricity and of the devices that I describe." If that had been in Mr. Bell's fifth claim, would anybody have had the impudence to say that he was not thinking about a telephone? Would anybody say, then, that he had stubbed his toe on a hidden fact in nature? Now, then, if all these witnesses swear, the witnesses who have tried it, witnesses who have demonstrated it, that the Reis instrument will talk, and Reis' object is to produce speech, and the evidence is that he succeeded, what right has anybody to say that this is an error, that this is an idea not born, still lingering in the womb of time? When we take into consideration the state of the art at that time, the devices of Reis are simply marvelous. Can there be any doubt upon this one question? If this decision, made by the examiners in chief, is based upon the assumption that the Reis instruments will not transmit speech, then they are in error, and their judgment should be set aside. Now, we have proved two things. First, the transmitter talks with the Reis receiver; it talks better with the Bell receiver. It talks with a better transmitter, but the transmitter and receiver as constructed by Reis will transmit articulate speech. When you talk to it so loudly that it refuses to transmit, it is not an infringement of Bell's claims. When you talk to it softly, so that speech is transmitted, then you violate Bell's claims. In other words, the absolute question is whether Bell's patent rests on the difference of tone. If you speak loud, they say it does. Here comes Mr. Bell and says: "I have got the theory. True, I had no machine, I had no device except a fragrant odor of expectation blowing like a broken cloud in my brain, but I have got the theory. You have got to have an undulatory and continuous current." "But," says another, "I can break it many thousand times a second." "Well," replies Mr. Bell, "if you break it too often, it becomes continuous, and then you infringe." The Reis instruments will speak, and I say now I am willing to risk the entire case and everything connected with it upon the simple question: "Will this instrument that I now touch (referring to the instrument on the table) transmit articulate speech?" and I may say beyond a doubt it is an exact facsimile of the Patent Office model and it will transmit speech. Yet that is the instrument that won't talk. That is the instrument that has the impudence to fly in the face of a theory of Professor Cross. That is a fact that just stands right up and denies a theory, and you can imagine the impudence it takes in a fact to do a thing like that, especially a Western fact, in the presence of an Eastern theory.

Among other reasons for demanding a new trial, Mr. Ingersoll declared that when the motion was submitted to Commissioner Butterworth he distinctly stated that if he found that he had to decide it against the Bell people, he would send it to his successor.

Educate the Coming Man.

We have often referred to the importance of training boys in some systematic and thorough manner for the serious business of life. It should be urged for not only the mechanical pursuits, but also for those who propose to embark in the higher paths of professional work. Many an architectural student in this country, wisely says the *Northwestern Architect*, would be better prepared for the struggle for success in his profession had he been the recipient of a sound technical education before entering upon his pupilage. In the past most of the hue and cry has been for the better technical education of the artisans, and it would be well for the architectural profession not to lose sight of the fact that the education of the master should increase in proportion to the advancement made by the workman. We want a better and more widely diffused method of technical education for both the artisan and the master. It is, however, expensive business, and while some of our schools and colleges have provided laboratories and workshops, there is a wider range of general technical education than has as yet found lodgment in the West. We know of no country where the lack of good preparatory schools into which the more promising pupils from the elementary grades could be draughted is more severely felt than in this, and the endowments of philanthropic gentlemen could not be better employed than by providing for this most necessary education. The benefit to the country would be so great that the establishment of the schools would become a matter of national concern, and if our country's prosperity is not to become a thing of the past, we must develop the latent resources of intellect and talent among our workmen to a greater extent than ever before.

NOTE.—Mr. Daniel H. James, whose improved extension gauge for use in planing, turning, etc., was described and illustrated on page 195 of the issue of March 31, 1888, desires us to state that his address is 347 Pear Street, Scranton, Pa.

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MOVING THE BRIGHTON BEACH HOTEL.

We illustrate in our present issue the moving of the Brighton Beach Hotel, one of the great buildings of Coney Island, near this city. For many months there has been a marked tendency on the part of the water to wear away the sandy beach upon which the building was erected. During the past winter this tendency increased, and assumed alarming proportions. It is possible that the erection of protecting bulkheads on the neighboring property had the effect of creating a scouring action on the part of the waves and currents. Whatever the cause, during the past fall and winter months the sea advanced. The music stand, once safely on the beach between the ocean and the hotel, was surrounded by water, and remained supported by piling a few feet above the tide. The water still encroached, and soon made its way under the hotel, and it was evident that unless some preventive measures were taken, the house would be undermined, and carried away.

An adjoining building, of much smaller size, called the pavilion, had already been moved several times as the waters advanced. Small as it was, compared with the hotel, it had been moved in three pieces, having been cut into sections for the purpose. After this experience the most natural idea was to attack the problem of dealing with the great hotel upon a similar basis. It was proposed to saw it into a number of sections, and to move it back piecemeal. The cost of the operation deterred the managers from attempting it.

The hotel is owned by the Brooklyn, Flatbush, and Coney Island Railroad Company. The superintendent of the road, Mr. J. L. Morrow, and the secretary, Mr. E. L. Langford, in discussing the matter, originated the highly ingenious and novel plan which was adopted. Its execution was confided to Mr. Morrow. The plan was to place the hotel upon a number of freight cars, resting on parallel tracks, and to draw it where wanted by locomotives. The nearest approach to such a method is to be found in the Eads ship railroad, and the moving of the gigantic hotel is a happy augury for the success of the other project.

MOVING THE BRIGHTON BEACH HOTEL, CONEY ISLAND.

The building is a wooden structure four hundred and sixty-five feet long, one hundred and fifty feet deep, and three stories high, as regards its main portions. Five towers rise from the roof. Its longer front faces the sea. It had to be moved backward in the direction of its shorter axis. The estimated weight of the structure was five thousand tons. From one hundred to one hundred and fifty tons of plaster were contained within it. It rested upon a series of short posts which, in their turn, were supported by piling.

The first operation was to lay a series of parallel tracks from underneath the building. Longitudinal planks two inches in thickness were placed in the lines where the rails were to run. Upon these the cross ties, or sleepers, were placed, and sand was eventually rammed under the planks and sleepers alike. This gave the sleepers a double support, directly from the earth and also from the stringer planks. The rails were of the ordinary type, weighing fifty-six and sixty pounds to the yard. They were laid with a four foot nine inch gauge rod, and rather freely, so that their gauge was probably five-eighths of an inch more than the normal. The idea of this was to provide for any lateral play that might be necessary. Twenty-four lines of track were laid, and were carried under the building and out from it about three hundred feet landward. To lay track for moving the building its own depth, a mile and a half of rails were required. Ten thousand ties were used.

One hundred and twelve platform cars were hired for carrying the building. They were supplied by the Iron Car Co. Their brake wheels were removed and stowed, each pair under their own car. The building was next attacked in twenty foot sections, and jacked up.

One 90 ton, three 60 ton, five 30 ton, and four 10 ton hydraulic jacks were used. The sills were raised from the supporting posts and the cars were rolled under, carrying with them transverse timbers of 12×14 yellow pine. Each piece rested upon two cars on adjacent tracks, the longest timber being only forty-one feet long. One hundred and ten thousand feet of this timber was required. As far as possible the timbers were made to bear upon the central axis of the car, and over the trucks. The house was raised enough to permit the cars and timbers to go under it, but one or two inches clearance being allowed for. In one place the building had settled nearly a foot. This was straightened up. The cars on each track were coupled together, and then were jacked apart so as to pull out the drawheads to their fullest extent. The weight of the building lowered upon the cars kept them in this position. In some cases this jacking apart was omitted. Such cars were connected by rope slings twisted so as to rigidly hold them together. The idea was to prevent any separation or alteration of the longitudinal distance between cars. No system of diagonal bracing was used, the utmost simplicity characterizing the arrangement.

In sections of twenty feet the whole building was gradually placed upon the cars. It is believed that the strain upon some of them cannot have been less than seventy-five tons, yet nothing has given away, although the springs were strongly compressed, so that the bolsters were nearly in contact.

A number of heavy blocks and falls were now connected to the front ends of the twenty-four lines of cars. As abutment the forward blocks were attached by chain slings directly to the rails. The tackles were arranged so that there were twelve falls, the end of each of which was carried to the motors. A number of thirty-five ton locomotives were on the ground. They were placed upon two tracks, and six ropes leading from the falls were attached to the coupling at the rear of each set of engines. Some of the tackles crossed each other, so that each set of engines had its pulling strain distributed over more than half the face of the building. The strain was taken up on each fall before it was attached. Three tons of rope were used in making these connections. The handling of falls, etc., incidental to their final arrangement was executed partly by a small engine. A man was sent around under the hotel with a steel wire to work the oil and waste well around the journals of the wheels. This was no small affair, as there were nearly nine hundred to be attended to.

When all was ready, the signal to start was given. For the first pull, April 3, the orders were to start the building and then immediately stop. Six locomotives were used. The ropes gradually tightened, and the building without a shake or tremor moved back majestically, and stopped after a short distance had been traversed. A careful examination showed that all had worked perfectly. On the afternoon of the same day a longer pull was given. Then on April 4, with only four engines, the hotel was again moved, and was left two hundred and thirty-nine feet back of its original position. The work now had to stop as far as moving the building was concerned, because the rails were not laid any further and because the piling for the new foundation was not all driven. The rails, sleepers, and stringers left between the house and the water were transferred to the front, and a way provided for the hotel to move the rest of its journey to its new resting place, four hundred and ninety-five feet from its original location.

No difficulty of any kind was encountered. Want of power had been the principal thing that was feared, but four locomotives proved enough to carry the house along at the rate of a fast walk. The engines were found to work admirably in producing an absolute and definite pull. Windlasses or capstans might have been used, but Mr. Morrow felt that they were inferior to the engines, because of the tendency of the rope to slip upon the drum. The total weight moved was placed at one thousand tons for the cars and five thousand for the building. This represents the weight of about one and a half miles of loaded coal cars, or of a large ocean steamer.

Reference has already been made to the Eads ship railroad. In the moving of the great hotel, a far more difficult task than that called for in the operation of the ship railway was accomplished. Instead of a ship, compact and strongly built to resist every kind of strain, a large house, of relatively little intrinsic strength, was dealt with. A little settling or inequality of movement would have wrecked it. As regards power, light locomotives only were used. Compared with an iron, or even wooden, ship, the hotel might be pronounced a house of cards. The confidence in the Eads scheme cannot but be largely increased by this feat in engineering.

Boston Hot Water.

A system of hot water distribution is being introduced in Boston. Thirteen thousand feet of mains have been laid, and lateral connections are in progress. Hot water under a pressure of about 300 pounds to the square inch and heated to 350° to 400° is used. The supply pipes are 4 inches in diameter and the returns 8 inches. These pipes are thoroughly covered by non-conductors of mineral wool and asbestos paper, and rest upon rollers, and also have suitable stuffing boxes at frequent distances to allow for expansion and contraction. The tunnel or subway containing the pipes is surrounded by a double row of brickwork with an air space between, and frequent manholes lead to the surface.

It is proposed to use this system for steam heating, making use of reducing valves to diminish the pressure from the water pressure of 300 pounds to the square inch to some convenient amount, allowing it to expand into steam. The portion of the water which is not converted into steam will be able to return to the system through the large return pipes before referred to. In addition to ordinary purposes for which steam is used, it is the intention of applying it for protection against fire. It is estimated that there are 1,000 buildings within the area selected for the work of the company, and containing 130,000,000 cubic feet of space requiring artificial heat in cold weather. This, in addition to the amount of steam power required for elevators and some minor manufactures, will represent an aggregate of 10,000 horse power from the station.

Naval Carrier Pigeons.

The French authorities are attempting to make use of carrier pigeons for conveying information from war ships at sea to certain stations on land, and with this object have fitted up on the St. Louis a dovecote, painted the most gorgeous colors, in order to permit the birds to recognize their home from a great distance.

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THE ROMAN AQUEDUCT AT NIMES.

One of the most interesting old cities one visits in his travels abroad is Nimes, in the south of France, about 60 miles from Marseilles, founded so long ago that the historian tells us that it was subjugated by the Romans one hundred and twenty-five years before the Christian era. Like nearly all the old cities of France, Nimes contains a cathedral, a weather-worn citadel, and a Roman amphitheater—all in a fair state of preservation. The latter, in size, is next to the Coliseum at Rome, and is in quite as good condition, and before its partial destruction was capable of seating 20,000 persons. The date of its construction is unknown, or the name of its founder, but it has been attributed to the reign of Titus and Hadrian. History tells us it was used as a citadel at one time by the Visigoths. It is now sometimes the scene of bull fights.

The next building of importance, and perhaps the most interesting of all, is the Maison Carrée, a beautiful Corinthian temple in good state of preservation. The tomb of Mr. Jay Gould, which was illustrated in these columns not very long ago, closely resembles this ancient temple, and there is little doubt the Gould tomb was copied from it.

After about ten or a dozen miles ride from Nimes, on the road to Avignon, another interesting old walled city, full of historical interest, we come to the famous aqueduct known as the Pont du Gard, which our engraving very perfectly represents. This interesting and stupendous structure, the historian tells us, dates back to some twenty years before the Christian era. It is supposed to be part of the aqueduct erected by Agrippa, son-in-law of Augustus, for the purpose of conveying water from Uzez to Nimes. It is built in the Tuscan order, and is composed of three separate bridges or rows of arches, one above the other, the river Gardon flowing under the lowest, which is 530 feet long and 65 feet high; the next above is 846 feet long and 24 feet high; the upper tier is 870 feet long and 25 feet high; the whole structure being 188 feet high, 19½ feet wide at the base, and 4½ feet at the top. The lowest bridge has 6 arches, the next 11, and the uppermost 36. The watercourse at the top is large enough to permit a person to walk through it. The stones of which it is constructed are of immense size, and devoid of all ornament. The picturesqueness of the valley over which this stupendous structure stands makes it one of the most attractive curiosities to visit in the south of France, and one of the best preserved monuments of Roman greatness. It is solid and indestructible in appearance, as the structure has proved to be, having very fortunately escaped destruction during the middle ages. In 1600 it sustained some injury, when a portion of the second tier of arches was broken away by the Duke de Rohan in making a passage for his artillery. This has since been repaired, and in 1881, when the writer visited this remarkable bridge and walked through the aqueduct which, nearly two thousand years ago, conveyed the water to Nimes, supplying her luxurious mosaic baths, it was difficult to discover in what part the injury had taken place.

THE PONT DU GARD—ROMAN AQUEDUCT AND BRIDGE AT NIMES—2,000 YEARS OLD.

Unsafe Safes.

At a recent meeting of the Liverpool section of the Society of Chemical Industry, Mr. Thomas Fletcher, F.C.S., gas engineer, of Warrington, gave a demonstration of the application of some new gas heating appliances, devised by himself for workshop emergencies, one of the feats of the evening being the fusion of a large hole in a plate of ¼ in. thick wrought iron, in a few seconds, without preparation, and with apparatus which could be carried by a man up a ladder and used in any position. The secretary, in the discussion which followed the experiments, raised the very serious point that with such apparatus as Mr. Fletcher had exhibited and used, a burglar proof safe no longer existed, as it was simply a question of minutes to fuse a hole large enough for a man to enter in any wrought iron or steel door in existence. Chilled iron or steel was powerless to resist the small blowpipe Mr. Fletcher used, which would penetrate thick iron and steel plates as readily as ordinary carpenter's tools would penetrate wooden doors. The apparatus was devised by Mr. Fletcher for works repairs, and was noisy in action; but, as he explained, the apparatus could be made silent, and small enough to carry in a hand bag. This is a very serious matter for bankers and others who have valuable property, and one which will have to be taken up at once by the safe and strong-room makers.

It is very well known that the professional burglar is ready to utilize the latest applications of science for his own ends. In fact, Mr. Fletcher's furnaces designed to assist in chemical research are well known as being used by receivers of stolen goods to reduce plate and jewelry to ingots, and these furnaces may be seen in the detectives' museum at Scotland Yard. Bankers have already taken the alarm, and have visited Mr. Fletcher's works with the object of seeing the extraordinary ease with which large openings can be fused in heavy iron or steel plates. It is hardly necessary to say that Mr. Fletcher plainly declares his intention not to devise a silent form of the apparatus, which naturally would be required only for burglars' use, but the light fingered profession will no doubt take the matter in hand, and most probably succeed in making the apparatus silent—a modification which Mr. Fletcher states can be done. During our own interview with Mr. Fletcher on this very serious matter, he informed us that the present danger is possibly not so great as it appears, owing to the fact that the apparatus necessary to manufacture and prepare the silent arrangement is both costly and large, and, therefore, as the person who prepares it must have fixed machinery and plant, he will most probably be one of the class on whom the enterprising burglar would first try his powers.—*Warrington Guardian.*

A Sculptor's Casts at Auction.

The veteran sculptor, Sir John Steell, having given up his large studio in Edinburgh, the models and contents of it were recently sold by auction. To use the words of an English contemporary, the prices were miserable. The cast of the head and face of Sir Walter Scott taken after death was sold for 5s., but, small as was the sum, it was fourfold what was given for casts of Napoleon and Canova. Six heads of celebrities, including the Prince of Wales, went for 9s., and for another series of six the price was 5s., although Dr. Chalmers was one of the subjects. Four plaster busts realized 24s., a recumbent figure of the Earl of Shrewsbury 20s., and a statue of Lord President Boyle 21s. The casts from the antique were not more in favor. Twenty shillings were paid for four sections of the Elgin marbles, 22s. for the Venus of Melos, 5s. for the Medicean goddess, and 5s. for the Townley. The casts of the large statues, equestrian, seated, and standing, could find no bidders. The sculptor's modeling tools went for a guinea.

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The Corrosion of Ships' Bottoms.

Admiral Colomb, who presided at a meeting at the Royal United Service Institution, some time ago, when Mr. Henwood submitted his views on the subject, said very truly that nobody knew very much about the subject one way or another, and yet he referred to the fouling of ships as one of the weakest spots to be feared in a blockading squadron, more so now than it was at the end of the last century. This is a question that also closely affects ship owners, not only in the matter of the wholesale deterioration of their property, but in increased expenditure, owing to protracted voyages and increased consumption of coal. Mr. Henwood instanced the case of the French ironclad Invincible, which had not been docked for ten months. At the end of that time her greatest speed was 9·8 knots, with 51·5 revolutions. When she was docked, fully ten tons of vegetable matter and barnacles were removed from her bottom, and after being cleaned her speed was 13·2 knots, with 53 revolutions. A case nearer home was that of a vessel carrying 3,500 tons dead weight, which maintained a speed of 10 knots on the passage to Cape Town, but, after proceeding to Cocanada, and loading for home, her speed during the remainder of the voyage was reduced to 7 knots. When placed in dry dock, on her arrival in England, she looked exactly like a half-tide rock, and four rail-truck loads of barnacles were removed from her bottom. When cleaned she again made 10 knots with the same boiler pressure.

The direction in which scientific men have been experimenting of late years, with a view to solving this difficult problem, has been toward discovering some means of securely fastening sheets of zinc on to the iron plating, so that, an electric or galvanic relation being established between them, the iron or steel would cease to be susceptible of corrosion, and the outer surface of the zinc would be kept comparatively clean by a slow process of oxidation, which would carry away with it the barnacles and vegetable matter. The plan adopted by Mr. Henwood to obtain this end is the soldering of sheets of zinc, 8 feet long and 3 feet wide, on to the iron or steel plating by means of a zinc solder, the attachments being made at about 12 inches from center to center. A template is made of the size of the sheet zinc, with holes about ⅝ inch in diameter, 12 inches from center to center, and 6 inches from the edges. A zinc sheet has similar holes punched in it, and around each hole a layer of zinc solder is fixed about 1 inch in width; also along the upper and after end. The template is then applied to the side of the ship where the sheathing is to be applied, and its position marked on the ship, and the position of the holes. At the position of the holes the oxide of iron or steel is removed for an area of about 2½ square inches, and covered with a layer of zinc solder.

The sheet of zinc is then put in its place and the solder united with a hot soldering iron, the holes in the sheet are filled up flush, and the attachment is then complete. It is calculated that a practiced hand can make about sixty attachments in an hour, and the largest vessel may thus be sheathed with zinc in about a week or ten days. The cost at present, without special appliances, is about 10s. per square yard.

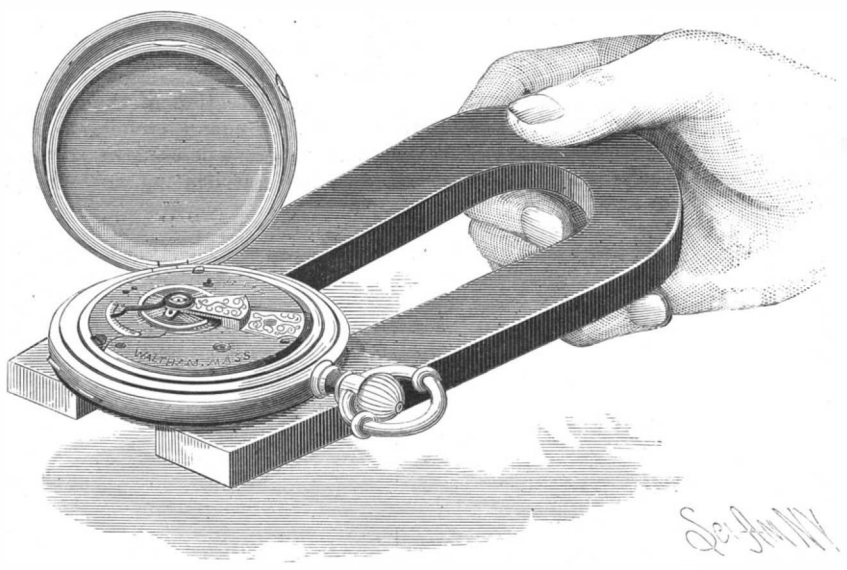
Curious Facts Relative to Alloys.

Alloys, formed by melting two or more metals together, present some very interesting characteristics. One of the most curious is the fact that the melting point of the alloy is usually much lower than that of any of its components. Wood's alloy, for instance, which consists of lead, tin, cadmium, and bismuth, melts at about 150° Fah., while the lowest melting point of any of the metals separately is that of tin, 446°. It has always been supposed that this alloy could only be formed at a comparatively high temperature; but Mr. William Hallock has recently shown that when the several metals are mixed together in filings, and exposed for twenty-four hours to the heat of an ordinary water bath (212°), the alloy is produced, and the mass becomes fluid, and that the previous fusion of either constituent is unnecessary. This fact the *Popular Science News*, from which we copy, thinks is of the highest scientific importance, and that it has never been observed before.

THE Texas wheat-growing counties report the increase of acreage this season at from 10 to 100 per cent.

THE WALTHAM NON-MAGNETIC WATCH.

People carrying valuable watches, or depending upon pocket timepieces of any kind, seldom properly appreciate the risks they run of destroying their accuracy and rendering them totally unreliable by going anywhere near electrical machinery, of which the use is now becoming so general. From this one cause probably proceeds more of the "crookedness" in the watches now made than can be attributed to any other one source, and it is a difficulty which watchmakers have been earnestly striving to meet by the use of anti-magnetic shields, composition balance wheels, etc.



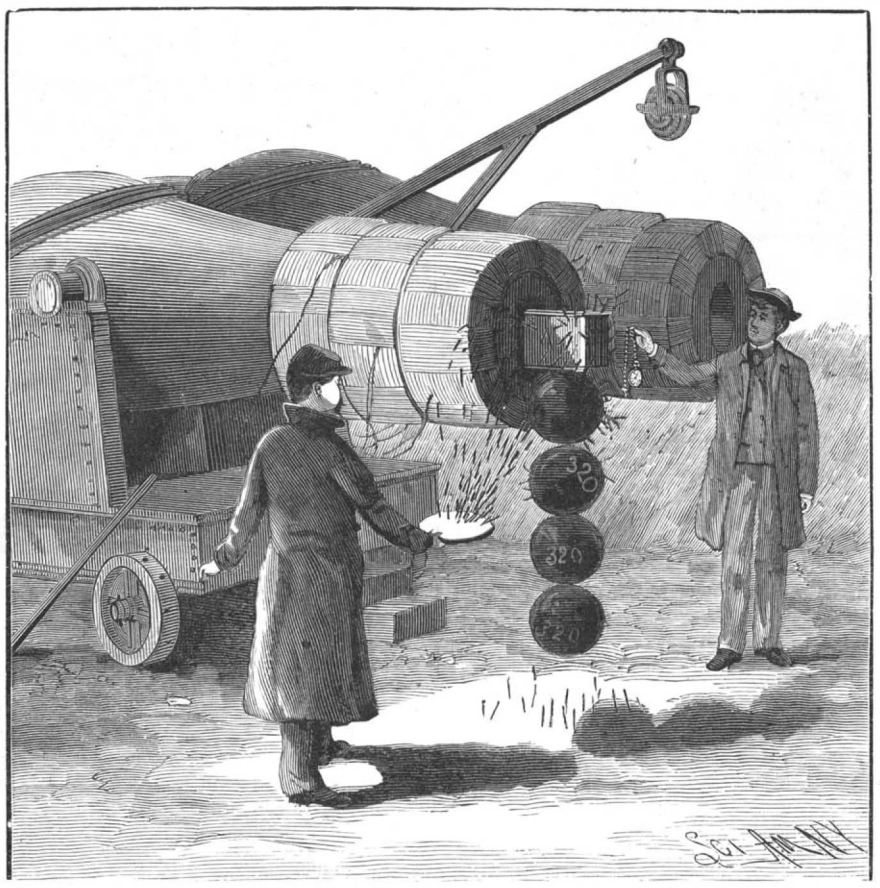
TESTING WALTHAM WATCHES WITH A HORSESHOE MAGNET.

What seems to have been a successful effort in this direction, by the American Waltham Watch Co., was recently made the subject of an interesting test. The company, after a long series of experiments, has perfected an alloy for use in their balance wheel, escapement, and hair spring which is apparently non-magnetizable and not affected by proximity to the strongest dynamos. One of their regular watches, provided with these parts made of this alloy, was subjected for fifteen minutes to the influence of Major King's great cannon magnet at Willets Point, N. Y., without at all affecting the time of the watch. This great magnet was described in the SCIENTIFIC AMERICAN of January 14, and is shown in one of the accompanying illustrations, two 14 inch Dahlgren guns, weighing over 50,000 lb. each, being utilized for its construction. Their muzzles were wound with about eight miles of No. 20 insulated copper wire, three coils to each gun, and the guns were connected at the breech by a pile of railway bars, the electrical current being furnished by a 30 horse power dynamo. The watch was held in close proximity to the muzzle of one of the guns, forming one pole of the magnet, where the magnetic current was strongest. Its main spring and other portions became so highly charged as to retain their magnetism for several days afterward, but the hair spring, balance, and escapement were so totally unaffected that the rate of the watch, as noted by an astronomical clock before, during, and after the experiment, showed no change whatever.

The severity of this test may be imagined when it is considered that, in other experiments with this great magnet, a pull of five tons upon the center of the armature failed to detach it; that four fifteen-inch shells, weighing 320 lb. each, were suspended by magnetic attraction in a vertical line from one of the guns; and that a crowbar was attracted with such force that it required four strong men to drag it away, while a string of carpenter's spikes, placed lengthwise one against another, stood out between three and four feet horizontally, upheld by the magnetic force. As might be expected, a watch which would withstand such a test could not be affected by actual contact with a dynamo, on which the watch was placed and allowed to remain for a time, with no different result from that obtained on the trial with the great magnet.

A further test, however, and one which it is readily within the power of most people to apply to a watch, is shown in one of the illustrations, the submitting of the watch to the magnetic influence of an ordinary horseshoe magnet. Such a magnet as this will at once stop the motion of an ordinary watch, and destroy its time-keeping qualities until demagnetization has been effected, a matter often costing much time and trouble. Yet such trial as this is invited on all Waltham watches provided with their new balance wheel, escapement, and hair spring, thus affording purchasers a ready means of testing the non-magnetizable quality of these watches. The use of dynamos is now becoming so general that one never knows when he may be in close proximity to one, either in traveling on the cars, visiting places of amusement, inspecting goods in stores or warehouse, or in manufacturing establishments of any kind. Their influence is not interfered with by the interposition of walls or partitions, and the hitherto trusted timepiece needs but to be brought sufficiently near to be rendered worthless, or have its value seriously impaired, while the owner may be in total ignorance of the cause.

The result now obtained by the Waltham Company is said to be secured without any sacrifice of the qualities desired in the parts of the watch made of their improved alloy, the latter itself being slightly different in the different parts. In fact, the balance and hair spring made of this new metal are non-oxidizable, which insures greater perfection in the manufacture, as well as being an advantage in use, and the parts are finally hardened in shape, which increases the facility of accurate adjustment. Owners of watches made by the Waltham Company will be pleased to learn that they can now, for a moderate sum, have their watch movements refitted with these non-magnetizable parts, and thus made proof against the influence of electrical machines.



TESTING WALTHAM WATCHES WITH THE GREAT CANNON MAGNETS, WILLET'S POINT N. Y.

Costly Halls in New York Houses.

The *Plumber's Journal*, referring to the costly and elegant halls to be found in a modern New York house of the first rank, says, what we have for some time observed, that the people of wealth and taste have entirely abandoned the straight hall of the narrow block house, where the stairs go straight up and the narrow passage to the back parlor and basement stairs goes straight back. Instead they have made the hall the central feature of the establishment, to which, if necessary, everything else is subordinated. The new type of hall is elaborate in its architectural features, richly antique in its furnishings, and it is upon the hall that the decorative effect of the house is centered. The hall, indeed, is so much of a hobby that people build new houses in order to have halls.

It is not an unknown thing to give up the whole first floor to the hall, putting the parlor on the second floor. Whether the hall be big or little, its furnishing is a thing which its mistress is giving much attention to nowadays. To be quite perfect, it should be done up in old oak and have "settees" standing about in room of chairs. It should have a big oak table, a smaller one to hold a silver salver, on which a guest's card is taken to the lady of the house, and its floor should be of oak, polished till it shines. The hall is of quite as much consequence as the drawing rooms.

THE world's annual consumption of wheat is estimated at 2,165,000,000 bushels.

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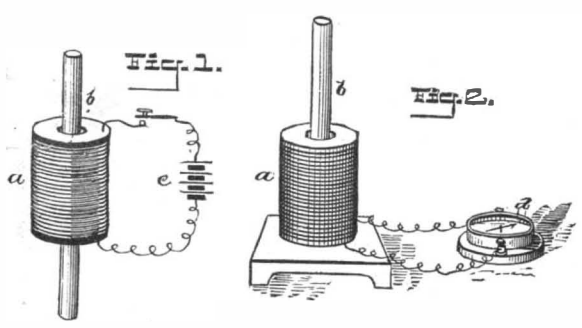
EXPERIMENTS ILLUSTRATING THE PRINCIPLE OF THE DYNAMO.

BY GEO. M. HOPKINS.

I.

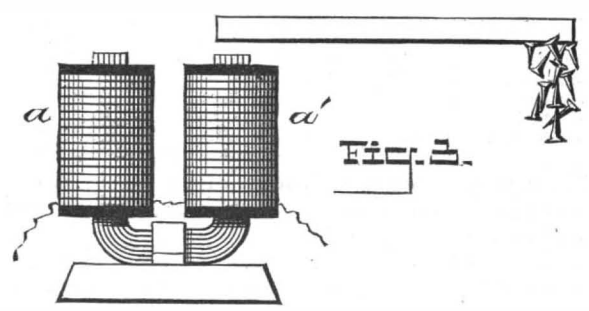
The great development of electricity in recent years, especially in the line of electric illumination, has served to add luster to the name of the immortal Faraday, and to show with what wonderful completeness he exhausted the subject of magneto-electric induction. Since the close of his investigations no new principles have been discovered. Physicists and electrical inventors have merely amplified his discoveries and inventions, and applied them to practical uses. The number of those who are familiar with the discoveries of Faraday and their bearing on modern electrical science is not only large, but rapidly increasing, but there are those who are still learners, to whom new things, or old things placed in a new light, are ever welcome. To such the simple experiments here given may be an aid to the understanding of induction as developed in dynamos and motors.

Any one at all acquainted with electrical phenomena knows that a hardened steel bar surrounded by a coil of wire which is traversed by an electric current becomes permanently magnetic. It is perhaps unnecessary to reiterate the accepted theories of this action, as they are well established and appear in almost every text book of physics. The fundamental magneto-electrical experiment of Faraday was exactly the reverse of the operation of producing a magnet by means of an electrical current. That is, it was the production of an electrical current by means of a magnet and coil. In the first instance the magnetizing power of the electric current is employed to bring about the molecular change in the steel bar, which manifests itself in polarity. In the second instance the magnetized steel bar is made to generate an electric current in the wire of the coil. In the first instance the current moving in the wire of the coil induced magnetism in the steel. In the second instance the movement of the magnetized steel within the coil induced a current in the wire.



1. MAGNETIZATION OF STEEL BAR. 2. MAGNETO-ELECTRIC INDUCTION.

The method of magnetizing a bar of steel is clearly shown in Fig. 1, in which *a* is a helix of six or eight ohms resistance, *b* the bar of hardened steel, and *c* a battery of four or five elements. A key is placed in the circuit, but the ends of the wires may be made to serve the same purpose. By closing and opening the circuit

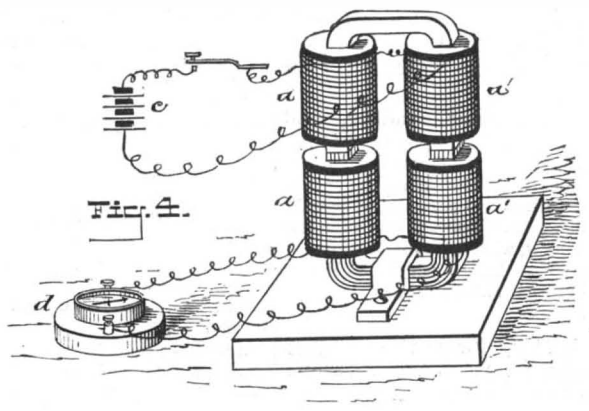


MAGNETIC INDUCTION.

while the steel bar is within the coil as shown, the bar instantly becomes magnetic. When the coil is disconnected from the battery and connected with a galvanometer, *d*, as shown in Fig. 2, and the magnet, *b*, is suddenly inserted in the coil, the needle of the galvanometer will be deflected; but the action is only momentary. The needle returns immediately to the point of starting. When the magnet is quickly withdrawn from the coil the needle is deflected for an instant, but in the opposite direction, and, as before, it immediately returns to the point of starting. It is obvious that if these electric pulsations can be made with sufficient rapidity to render them practically continuous, and if they can be corrected so that pulsations of the same name will always flow in the same direction, the current thus produced may be utilized.

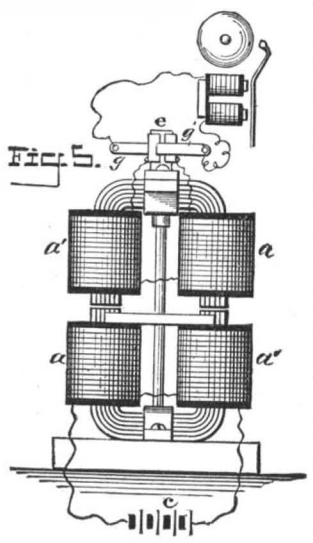
Before proceeding further with the consideration of magneto-electric induction, it will be necessary to briefly examine the subject of magnetic induction, as it is intimately connected with the action of the dynamo. In Fig. 3 is illustrated the usual experiment exhibiting this phenomenon. An electro-magnet like that described on page 214 of the current volume of the SCIENTIFIC AMERICAN is connected with a suitable battery, and a bar of soft iron is held near but not in contact with one of the poles of the magnet. It becomes magnetic by induction, the end nearest the magnet being of a name different from that of the pole by which the induction is effected. The end of the bar remote from the magnet exhibits magnetism like that of the magnet pole of the magnet.

The relation of magnetic induction to magneto-electric induction is clearly shown by the experiment illustrated in Fig. 4. In this case two electro-magnets are arranged with their poles in contact. One of them is connected with a galvanometer, and the other with a battery. When the circuit of the upper magnet is closed, the core of that magnet becomes magnetic, the core of the lower magnet becomes magnetic by induction, and the galvanometer needle is deflected. When the circuit of the upper magnet is broken, the galvanometer needle is deflected in the opposite direction, showing that the results are precisely the same as in the experiment illustrated by Fig. 2. In this case no mechanical movement is necessary, as the magnetism is introduced into the coils of the lower magnet by induction. It is thus shown that it is not necessary to move any matter to secure magneto-electric induction.



INDUCED CURRENT FROM INDUCED MAGNETISM.

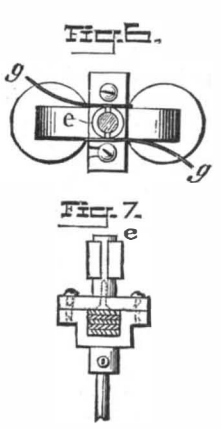
In Fig. 5 is shown an arrangement of electro-magnets in which one is fixed, while the other can be revolved. It is a device intended simply for showing how two ordinary electro-magnets may be utilized to advantage in experiments in induction.



SIMPLE CURRENT GENERATOR.

To the polar extremities of the fixed magnet is fitted a wooden cross bar, having in its center an aperture for receiving the vertical spindle, the lower end of which is journaled in the clamp that holds the fixed magnet to the base. The upper end of the spindle is provided with a yoke for holding the movable magnet. The cross bar which clamps the magnet in the yoke is held in place by two screws, as shown in Fig. 7, and to the center of the cross bar is attached a wooden cylinder, *e*, axially in line with the spindle. To the wooden cylinder are secured two curved brass plates which are connected electrically with the terminals of the coils, *a a'*, of the movable magnet, one plate to each coil. Two strips of copper, *g g'*, held upon opposite sides of the cylinder, complete the commutator. The copper strips are connected with any device capable of indicating a current—in the present case an electric bell—and the coils, *a a'*, of the fixed magnet are connected with the battery, *c*.

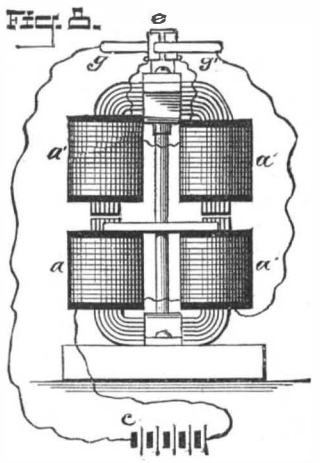
By turning the upper magnet, the following phenomena will be observed: 1. When, by turning the movable magnet, its poles are pulled away from the fixed magnet, the departure of the induced magnetism from the core of the movable magnet produces an electric pulsation in the coil which operates the electric bell. When, by a continued movement of the magnet in the same direction, the poles exchange position, another electrical impulse will be induced, and the bell will be again operated. 2. By examining these impulses by means of a galvanometer introduced into the circuit, it will be found that they are of the same name. 3. When the magnet is turned a little faster, these two impulses will blend into one, so that for each half of the revolution of the magnet the bell yields but one stroke. 4. By whirling the magnet quite rapidly, the current through the bell magnet is made practically continuous, so that the bell armature is drawn forward toward the magnet and held there.



DETAILS OF GENERATOR.

From what has been said, it will be seen that all of the positive electrical impulses are generated upon one side of the poles of the fixed magnet, and all the negative impulses are generated upon the other side of the fixed magnet, and that the curved plates of the commutator conduct all of the positive electrical impulses to one of the strips, *g g'*, and all of the negative impulses to the other strip.

In Fig. 8 is shown an arrangement of connections to convert the device into a motor.



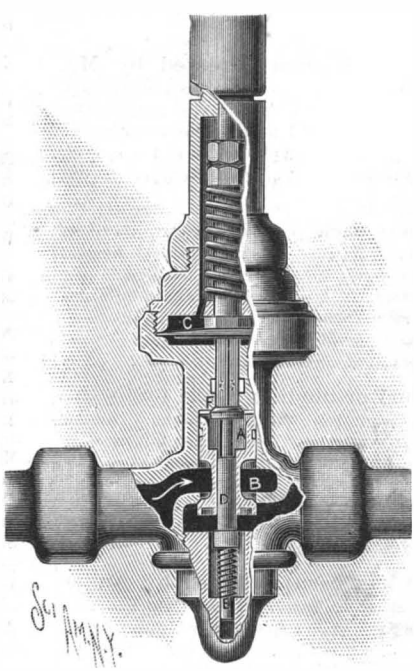
MOTOR.

Rendering Jewels Phosphorescent.

The collection of the Greek alchemists found in certain MSS. of the 13th and 15th centuries, in the National Library, describes processes used for the artificial coloration of factitious jewels, emeralds, carbuncles, and hyacinths. Stones were to be made luminous in the night by dyeing them with a mixture of copper rust and of the gall of the tortoise. A finer color was obtained by using the sea medusa instead of the tortoise. This coloration was, of course, not permanent, but it was easily reproduced.—*M. Berthelot.*

AN IMPROVED AIR PUMP GOVERNOR.

A governor especially adapted for the air pumps of locomotives, for preventing an excess of air pressure in the train pipes, and to cause an accumulation in the reservoir while the brakes are applied, is illustrated herewith, and has been patented by Mr. Edward G. Moore, of No. 505 Lombard Street, Wilmington, Del. The governor casing has a steam inlet pipe connected by a valve seat, B, with the steam outlet pipe leading to the pump. On the under side of the valve seat is held a valve with an upwardly extending hub carrying a piston, A, held to slide in an aperture not steam tight in an extension of the governor casing, so that steam may leak into the space above the piston. The valve and its hub are held to slide centrally on a spindle, D, having its bearing at the lower end in a nut, E, there being a coiled spring around the lower end of the spindle, while on its upper end rests a stem supporting the valve, F, held on a valve seat in an aperture leading to a space in the upper part of the governor casing. The valve, F, has upwardly extending wings, on the top of which rests a disk supporting a diaphragm, C, the diaphragm being held in place on the disk by a nut screwing on the lower end of a stem, around which is a coiled spring, one end resting in the bottom of the opening and the other end against a nut screwing on the stem near its upper end. The spring which holds the diaphragm in its upper position is set to a normal tension of say about seventy pounds, the diaphragm being forced downward when the pressure exceeds this amount, and imparting a sliding motion to the valve, F, allowing the steam on the upper side of the valve to escape through the waste pipe, and cutting off the steam supply from the pump. When the pressure in the train pipes is diminished, the diaphragm is restored to its former position, and a passage is opened for the steam through the inlet to the outlet and to the pump, until the air pressure is again restored to the required limit. By this device also the speed of the pump is limited and its wear reduced.



MOORE'S AIR PUMP GOVERNOR.

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ENGINEERING INVENTION.

A steam separator has been patented by Mr. Alexander Davidson, of Chicago, Ill. It consists of a steam pipe or section with spiral ribs on its inner side to give a whirling motion to the steam passed through, thus casting down heavy impurities where they will pass into a collector chamber, from which a pipe leads to the boiler, discharging under the water line.

MISCELLANEOUS INVENTIONS.

An ear battery for the deaf has been patented by Mary E. Moore, of New York City. It has a copper wire coiled around a zinc tube, and connected thereto by a wire shaped to enter the ear, in combination with a diaphragm held at the outer end of the device.

A hay rack has been patented by Mr. Calvin E. Hagerman, of Ainsworth, Neb. It is of light weight, adapted to be carried on a wagon, whereby hay or straw may be carried from the field to the stack or market, or loaded and unloaded in windy weather with comparatively little waste.

A sash fastener has been patented by Mr. Harry I. Williams, of Decatur, Texas. It consists in the combination of a ratchet bar attached to the sash, a grooved or hollow bar attached to the window frame and bearing a spring pawl engaging with the ratchet bar, and a wedge-shaped stop with supporting chain.

An electric vapor bath has been patented by Messrs. Robert F. Jackson and William R. Pope, of Baltimore, Md. This invention provides simple means by which the electric current from either a Faradic coil or from a galvanic battery, or both, can be applied to the human system for the treatment of disease, the current being easily regulated.

A land roller and clod crusher has been patented by Mr. Friedrich Twick, of Sheboygan, Wis. This invention covers a novel construction and combination of parts in a machine adapted for rolling, crushing, and pulverizing land, to prepare it for receiving crops, being an improvement on a former patented invention of the same inventor.

A lamp extinguishing apparatus has been patented by Messrs. Joseph Miller and Frank R. Page, of Olean, N. Y. It is a simple device capable of attachment to any lamp, and especially adapted for railroad car lamps, for automatically extinguishing the lamp in case of a collision or accident upsetting the car.

A fire extinguisher for car heaters has been patented by Mr. George F. Seaver, of Dover, N. H. A perforated plate is held in the top of the heater to which lead inclined pipes having balls containing a fire-extinguishing compound, an accident to the car causing these balls to be broken on the perforated plate, thus extinguishing the fire.

A car heater has been patented by Mr. James Wardle, of Hope, British Columbia, Canada. It consists of a stove made of an inner and outer cylinder of steel or iron, strengthened by outer attached metal bands, with a space between the cylinders for the circulation of air, and so constructed that its overturning will not allow the escape of the fuel.

A removable corset fastening has been patented by Selma A. Schoefer, of Brooklyn, N. Y. It has pockets at the meeting edges, arranged to receive the steels or clasps, there being lacing cords by which the edges of the flaps forming the pockets are united, so that the steels can be easily removed when the garment is to be washed.

A buckle has been patented by Mr. Tobias A. Lee, of Sidney, Ohio. It has a tongue support and tongue, combined with a pivoted loop movable down over the tongue and a spring for actuating the loop, avoiding the use of a pin tongue and the inconvenience experienced in inserting it through perforations in the strap to be secured.

A harness back pad has been patented by Mr. Limbrick W. Vandenburg, of Americus, Kansas. It has a metal frame entirely inclosed or covered upon the outer surface with leather, with pads upon the under surface, the metal frame being composed of three sections, a central curved section and two side sections hinged to the end of the central curved section.

A method of binding books forms the subject of a patent issued to Messrs. John J. Meston and Nate S. Dygert, of Portland, Oregon. It is especially applicable to shipping receipt books as used by draymen, expressmen, etc., strips bent to form longitudinal sockets being used in connection with a handle, whereby the books may be more conveniently handled and carried without mutilation.

A clasp has been patented by Annie Lewis, of Galveston, Texas. It has front and rear plates hinged together on a spindle on which is coiled a spring for pressing the plates from each other, the plates having toothed jaws, and a strap being secured to one of them for suspending the clasp, which is simple and durable in construction and effectively retains the clasped parts.

A washing machine has been patented by Mr. William L. G. Appleby, of Germantown, Md. The invention relates to machines having two presser boards, one supported on brackets on the inside of the box and the other suspended by links and oscillated with a sweeping motion by a crank shaft, one board adjusting itself by a spring connection to avoid tearing or injuring the clothes.

A combined step ladder and ironing board has been patented by W. J. Allen, of Arkansas City, and Belle West, of Winfield, Kansas. The ironing board has a clamp at one end and a step ladder hinged to its opposite end, a bosom board being hinged to the ironing board above the ladder to be folded over upon either, the bosom and sleeve board being folded over upon the ironing board when the device is to be used as a step ladder.

An embroidering machine attachment has been patented by Messrs. Edward Aldom and Henry E. Schmitz, of Brooklyn, N. Y. It is an improvement on a former patented invention of the same inventors for simultaneously working duplicate strips of chenille, etc., by throwing each strip alternately to opposite sides of the line of stitch, the two embroidering strips crossing each other and forming a series of more or less open loops.

A machine for cutting, sanding, and rolling roofing felt has been patented by Mr. Benjamin C. Waite, of Brooklyn, N. Y. It has a mechanism with a suspended sand hopper, by which the amount of sand discharged can be regulated, and provides for the knife being operated with a quick downward movement and a slow upward movement, while a peculiarly constructed mandrel is arranged so that the felt will be wound automatically, and the felt roll can be readily removed from the machine.

A galvanic battery forms the subject of two patents issued to Mr. Horatio J. Brewer, of New York City. A new and useful improvement in porous cup batteries is provided by these inventions, the construction being such that the electrodes are securely seated in place and the gases forming in the porous cup can readily escape, so as to prevent the adhesion of insulating bubbles on the negative electrode, and its polarization, thereby rendering the battery very effective at all times.

SCIENTIFIC AMERICAN

BUILDING EDITION.

APRIL NUMBER.—(No. 30.)

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4. Perspective elevation and floor plans of a dwelling costing two thousand two hundred dollars.
5. Floor plans and perspective view of a house costing three thousand two hundred dollars.
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16. Vicarage House, Herrington, Durham.
17. Full page perspective view of the Caldwell Hotel, at Birmingham, Ala., Edouard Sidel, architect.
18. Page of drawings representing some of the exhibits of the late display of the Architectural League, of New York. A Spanish Grille. A French Farm House. A row of New Houses, New York. J. H. Duncan, architect.
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The *sole* builders of "The Improved Greene Engine" are the Providence, R. I., Steam Engine Co.

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NEW BOOKS AND PUBLICATIONS.

A MANUAL OF STEAM BOILERS: THEIR DESIGN, CONSTRUCTION, AND OPERATION. By Professor R. H. Thurston. New York: John Wiley & Sons. Pp. 671. Price $6.

The Director of Sibley College, Cornell University, has in this volume fitly supplemented his other works on the materials of engineering and construction, and on steam engines, with a plain and practical treatise on the steam boiler, which, although primarily designed for technical schools and colleges, covers a much wider field than is likely to be included in any course of technical study, and is well worth a place among the text books of all who have troublesome problems to solve in any department of steam engineering. The rules and formulæ given for the determination of the efficiency of fuels, and measuring the realized values of combustion, under various conditions of steam making, superheating, condensation, pressure, and temperature, are generally such as can be applied by one having but a moderate proficiency in mathematics; and the mechanical details furnished, touching a wide variety of boilers, are so plainly set forth that one not an expert in the business can derive from this volume ample data upon which to decide as to the kind of boiler best adapted for any special service. The book is fully illustrated and has an excellent index.

ELECTRICAL INSTRUMENT MAKING FOR AMATEURS. By S. R. Bottone. London: Whittaker & Co. 1888. Pp. viii, 175. Price $1.20.

In this work appears the substance of the well known series of articles from the *English Mechanic*. The matter of the book is extremely practical—his treatment of the subject seems at times almost crude. Yet in this apparent crudeness will be found its greatest merit. The use of tools and application of processes is the first subject treated. Then the leading pieces of electrical apparatus are taken up *seriatim*. The gold leaf electrophorus, gold leaf electroscope, frictional electrical machine, induction or dielectric machines, condensers, volt and am meters, and much other matter, are described in detail. It is perfectly true that a difference of opinion may exist as to the author's treatment of some portions of his subject, but the spirit of the book is good, and it is a work that may be of much use to the amateur, student, and teacher. Had science taken its proper place in the schools of this country, this work would be of even greater use than it now will be.

STIMULANTS: USES, AND HOW BEST CONSERVED. By J. M. Emerson. New York: Dick & Fitzgerald. 1888. Pp. 61. Price 50 cents.

In this work the author is an advocate for temperance, in the sense that alcohol may be used temperately, and that its use may not degenerate into abuse. It is as much opposed to total abstinence as to intemperance. The work is well printed and attractive in appearance.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) G. F. C. asks: 1. How can I make a speed regulator for the electric motor described in SCIENTIFIC AMERICAN of March 17, 1888? A. Make a small governor like any steam engine governor, and in lieu of the steam valve use an electric contact and arrange the governor so as to break the circuit when the speed is too high. 2. How can I make a battery for same? A. Use a battery of 6 or 8 elements, each formed of one plate of zinc 6×8 inches, and two plates of carbon of the same size. Plunge these plates in the ordinary bichromate solution.

(2) S. F. desires (1) a polish for starch for laundry purposes. A. See answer to query 19 in SCIENTIFIC AMERICAN for February 25, 1888. 2. Can either wax or spermaceti be mixed with water so as not to separate when cold? A. No.

(3) F. J. F. asks how to make a cell containing six or eight divisions for plunge battery, with bichromate and sulphuric acid solution, and would a wooden cell covered with asphaltum or any other matter prove serviceable? A. Make the cell of wood with glass or wooden divisions let into the sides. For waterproofing, coat the wood with a mixture of resin 4 parts, gutta percha 1 part, and a little boiled oil, put on hot. Apply the composition thoroughly, using a hot iron to melt it into the corners.

(4) E. P. asks: Is there any way to stop the roaring of a mechanical telephone, and not interfere with the speaking? A. Use stranded steel wire for line.

(5) F. R. F. writes: In regard to the electric motor described in your issue of the March 17, will the motor run if connected with an Edison dynamo? How many ordinary "crowfoot" batteries would

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the motor require? A. It will run if connected with an Edison dynamo. It is not adapted to gravity batteries. 2. Are the ends of Russia iron in field magnets to be lapped or simply "butted" together? A. "Butted." 3. Is the wire on field magnet to be cotton covered or not? A. It is to be insulated with cotton, silk, or some other insulating material.

(6) J. C. R. asks: How would a hoop iron, secured by brass clamps at ends and angles to make needed width, work for constructing field magnet of simple motor, instead of sheet iron? A. Hoop iron will answer.

(7) H. S. D. writes: I want to make a dynamo after the pattern of the eight light described in the SCIENTIFIC AMERICAN and SUPPLEMENT, but of larger capacity. If I make it ½ larger, will it increase the amount of wire more than ½, and how many 16 candle power incandescent lamps will it run? How many lights will it run if it (the eight light machine) was doubled in all its dimensions? A. If you double the width of the field magnet, and also the length of the core of the armature, and wind the armature with No. 19 wire, and the field magnet with No. 12, you will be able to run from 16 to 20 16 candle power lamps. We shall probably at an early day describe a larger machine, of about the size you require.

(8) C. T. T. asks (1) for a process for using acid to eat metal, to make rough cuts for printing. A. See articles on Zincography, in SUPPLEMENT, Nos. 584 and 587. 2. Information telling how to read a horoscope. A. For good idea of the mysticism and illusion of astrology, subjects in which we do not assume to be conversant, read Walter Scott's "Guy Mannering."

(9) A. B. O. desires a formula for making a cheap, white soap from tallow. A. Dissolve 2 pounds sal soda in 1 gallon boiling soft water, mix into it 2 pounds freshly slaked lime, stirring occasionally for a few hours, then let it settle, ponr off the clear liquid, and boil 2 pounds tallow in it until all the tallow is dissolved. Add salt to precipitate the soap, and wash and dissolve in a little hot water. Cool it in a flat box, and cut it into bars or cakes. It can be scented by stirring in the desired perfume when cool. 2. One for same, by using cotton seed oil in place of tallow? A. See Carpenter on Soaps, Candles, Lubricants, and Glycerine, which we mail for $4.

(10) J. W. C. asks how to make old fashioned molasses candy not turn soft or sticky in warm or damp weather. A. Take 1 quart molasses, 1½ pounds brown sugar, the juice of a large lemon, and 12 drops of oil of lemon; mix the molasses and sugar together, butter the inside of a kettle and put it in. Let it boil over a moderate fire for 2 hours, then add the lemon juice, and boil ½ hour; stir it often to prevent it from burning, then butter a pan and put it in to cool; if sufficiently done, it will be crisp and brittle, if not, it will be tough and ropy.

(11) A. B. U. desires a receipt for an enamel or glaze for wood, to be impervious to water. A. Coat the article several times with hot linseed oil varnish.

(12) E. B. asks for something to make the teeth white. A. Take of dry hypochlorite of lime ½ drachm, red coral 2 drachms, triturate well and mix thoroughly. 2. What kind of flute is used for general orchestra work, and if an ordinary 12 keyed flute will do? A. Any flute will do.

(13) J. P. K. asks for an article for cleaning carpets without lifting them from the floor, one about as thick as mucilage, and in using which a quantity is taken on a brush and rubbed over the carpet, which is then washed up with clear water, leaving the carpet like new. A. Ox gall is the article to which you refer, and it is used in the proportion of three gills of ox gall in a pail of water.

(14) J. H. S. desires (1) a receipt for tanning buckskin, such as used in making gloves, and one for tanning with hair on. A. The manufacturers' processes are very elaborate, but an amateur can always preserve and taw such skins by treating them with salt and alum, after the skins have been well cleaned and softened through with water and working. The time necessary is from one to two weeks. 2. A receipt for making black ink, one that becomes very brilliant after writing, and free from sediment, and will not corrode the pen. A. Take 11 parts gall nuts, 2 of iron sulphate, ½ part of sulphate of indigo, and 33 parts of water, and add a small quantity of sugar. See also SCIENTIFIC AMERICAN SUPPLEMENT, No. 157, for numerous receipts on making inks.

(15) C. F. B. asks how to wash a chamois skin. If washed in an ordinary way, they are very stiff afterward. A. Use a weak solution of soda and warm water, rub plenty of soft soap into the leather, and allow it to remain in, soak for two hours, then rub it sufficiently, and rinse in a weak solution of warm water, soda, and yellow soap. If rinsed in water only, it becomes hard when dry and unfit for use. After rinsing, wring out in a rough towel, and dry quickly, then pull it about and brush it well.

(16) W. S. asks: What is "putz" pomade composed of, and how made? A. Take of oxalic acid 1 part, iron peroxide 15 parts, powdered rotten stone 20 parts, palm oil 60 parts, petrolatum 4 parts. Pulverize the oxalic acid, and add rouge and rotten stone, mixing thoroughly, and sift to remove all grit, then add gradually the palm oil and petrolatum, incorporating thoroughly.

(17) S. C. D. asks: Is there any way to color a meerschaum pipe that has been used and colored to bottom of bowl in good shape? Bowl will not color. A. Bowl colors better when stem portion is of meerschaum up as high as the top of bowl, otherwise it is difficult to color all of bowl.

(18) C. E. H. asks the proper way to pare an ingrowing toe nail, and to prevent it getting worse. A. Begin the cure by simple application to the tender part of a small quantity of perchloride of iron, which can be readily procured either in fluid form or powder at a drug store. The tender flesh is dried and tanned by this application, and ceases to be painful. When this hardened flesh has remained on two or three weeks, it can be easily removed by soaking in warm water. Further trouble can only be prevented by cutting the nails in proper shape and wearing shoes of reasonable size.

(19) L. D. W. asks: Is there any way to clean a marble bust which has become soiled by dust and finger marks? A. Mix quicklime with strong lye, so as to form a mixture having the consistency of cream, and apply it immediately with a brush. If this composition be allowed to remain for a day or two, and be then washed off with soap and water, the marble will appear as though it were new.

(20) J. T. M. asks why it is that the secondary coil of an induction coil is always composed of very fine wire, and will not coarser wire do equally well? A. By using fine wire in the secondary of an induction coil, more convolutions are obtained for the same volume, with consequent increased tension. Large wire would make the coil too bulky; small wire is used as a matter of convenience, and also to keep the secondary well within the influence of the primary.

(21) C. N.—Your greatest trouble probably arises from the burning of the corners of the chisels in forging. The corners should be no hotter at any time than the center. A slow fire or low blast is always necessary to the successful forging of steel-cutting tools. For various instructions in tempering, see SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 95, 103, 105.

(22) T. W. M. Co.—If you wish to make a chilled surface against a cold iron mould, use No. 2 American pig, with ¼ good scrap. If you wish simply to make hard castings in sand moulds, use No. 3 or 4 pig or No. 2 with ¾ scrap.

(23) V. S. M. asks for the best lubricant for central fire rifle cartridges. I have used tallow and wax, and mutton tallow alone, and in cold weather they scale off badly. A. Try paraffine or vaseline.

(24) J. A. R. writes: I have in my house brass door knobs. When they were purchased, we were told that they would not tarnish, but they do. I now want to turn them black without waiting the slow process of time. How can I do it? A. Thoroughly clean the varnish from the knobs with alcohol, and scrub with a brush and solution of soda. Then dip for a few seconds in sulphuric acid, rinse clean, and dip in a mixture of hydrochloric acid 12 parts, sulphate of iron 1 part, white arsenic 1 part, until the articles turn black. Rinse in clean hot water and dry in sawdust. Brush with black lead and varnish.

(25) E. D. D. asks: Does the mariner's compass in the neighborhood of the equator point north and south with the same certainty that it does in other latitudes? A. The magnetic needle does not point with certainty to the north except in a few places. It is better, on general principles, the nearer it is to the equator.

(26) C. M. R. asks if it is possible to take a 15 horse power engine and make it do 30 horse powers of work. The engine in question is high speed, and the boiler of 18 horse power. A. You can generally make a nominal 15 horse power engine do an indicated 30 H. P. of work. The point to gain is to double the steam pressure, which depends upon the strength of the boiler.

(27) M. R. asks: 1. Why should a wagon with solid iron axle run harder than with wooden axle? A. The coefficient of friction between iron and iron is probably higher than that between the hard wood of an axle and the iron of the box. 2. Would it not be better to have the feed water enter a steam boiler through the top of a good sized mud drum instead of entering through the top of the boiler? A. Modern experience and practice favor a surface feed. The mud drum should catch and hold the sediment ready to be blown out, and not be stirred up by feeding in that direction.

(28) G. W. S.—It will not pay you to undertake to make emery strips for your own use. For their manufacture you will require strong iron moulds with followers driven by a powerful press, capable of a pressure of a ton for each square inch. The cementing material may be glue and tannic acid, gutta percha or silicate of soda. The quantity must be so small that it does not adhere to the mould. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 125, on Emery and Corundum Wheels.

(29) E. J. T. asks: What would be the superior quality of copper pipe over iron pipe of same dimensions for hot water heating? A. Copper pipe is but slightly better than iron for radiating heat, although it is a much better conductor of heat. The difference in effect does not warrant the difference in cost for any ordinary purpose. The copper must be black for best effect.

(30) F. L. G.—A composition of 75 parts lead, 16 7-10 parts antimony, and 8 3-10 parts bismuth expands in becoming solid from a fluid state.

(31) W. K. asks the best solution for pickling iron and steel. A. Hydrochloric acid 1 part, water 3 to 4 parts, for quick or slow pickle.

(32) C. W. asks what the best journal and journal box are made from. And how would a cast iron journal running in a cast iron box compare with the best? A. Cast iron journals and boxes run well together with heavy lubricating oil mixed with graphite. The best is a steel journal running in a hard box made of copper 1 lb. to tin 3 oz.

(33) R. W. asks if there is any acid in which brass may be dipped, to clean it, which will clean it without hurting the article in any way? A. Oxalic acid solution in water is excellent for cleaning brass that can be brushed or rubbed. If you only wish to dip quickly, use strong nitric acid, dip for 1, 2, or 3 seconds and rinse in hot water.

(34) E. K. H. asks: 1. What metal, mineral, or other material can I use to keep heat in an iron vessel that is heated by hot air? I want it to radiate the heat if possible, several hours after the supply of heat is cut off, and iron alone will not answer the purpose. A. Water is a suitable material to store heat; also a solution of acetate of soda so strong that it will crystallize on cooling, thus giving off its "latent heat." 2. Would a double iron vessel with a dead air space between to store hot air be a good device? A. The storage of hot air for use is of no value. Its specific heat is very low, a great deal less than that of water. 3. If a permanent magnet becomes rusty will it spoil the magnetic properties, and to what extent or percentage? A. Not materially. 4. Is there any flexible tubing that is fire proof, so that it can be coupled in same manner as Westinghouse air brake hose? A. None to our knowledge. 5. Is hot water, hot air, or steam the healthiest for heating purposes, provided the hot air is perfectly pure and entirely free from gas? A. They are all equally healthy under the specified conditions of purity of the air itself. 6. In using hypochlorite of lime and chalk for a dentifrice, is there any powder that would not destroy the cleaning properties, that could be mixed with it to disguise the compound? A. Use ground arrowroot and scent with oil of rose or other essential oils or myrrh.

(35) J. A. P.—You can melt 8 or 10 lb. of old brass boxes readily in a blacksmith's forge by building a brick cylinder or square box around the tuyere large enough to have a clearance of 3 or 4 inches all around the crucible. Make it high enough to have 6 in. of fire under the crucible, and also to cover the top with coal. Charcoal is the best for fuel. Coke may also be used. Soft coal may be used, but requires good management. We can send you the Brass Founder's Manual, by Graham, for $1.

(36) R. H.—Moulding for and casting of iron is a difficult matter for a novice. We recommend you to study the subject by visiting an iron foundry and observing their methods. We can send you a book on iron founding, by Claude Wylie, for $1. Your engine should weigh not less than 150 lb. A 2 horse boiler may be made with 3-16 plates for shell, ¼ in. heads.

(37) A. M. Co. asks: How can we keep jelly from moulding? A. First cover the jelly with a piece of paper that has been dipped in brandy, and fits quite close to the jar at the edges, then cover tight with another piece of paper, so as to prevent as far as possible any entrance of air.

(38) C. P. M. asks the best method of driving boiler rivets. A. Hand and machine riveting are equally good, if both be honestly and faithfully done. Canted rivets, from their being too small or from the drifting of ill-matched holes, make most of the trouble, and lead to fault finding with the system, instead of the dishonest practices in the boiler shop.

(39) J. M. A. writes: 1. In the SCIENTIFIC AMERICAN of two weeks ago you gave instructions for making small electric motor. What battery is best to use, where can it be had, about what cost, or could it be made cheaper by procuring materials? A. A plunging bichromate battery is probably the best for the motor. 2. Would the field magnet work as well if made of solid iron as if of strips of stove pipe iron? A. You can make the field magnet of solid iron if you prefer it. 3. Could a cheap electric light be made that motor would drive to give light sufficient for an ordinary dwelling house? A. It would be better to, produce your electric light directly from batteries if you are unable to use a dynamo and steam power.

(40) H. H. writes: I found some difficulty in making the iron wire core of the armature for the simple electric motor recently described in the SCIENTIFIC AMERICAN. For the benefit of others who may undertake to make the motor, I describe my method: Take two pieces of wood about 1½ inches thick, with a piece of cigar box wood between them, and secure them together where the flanges will come, then turn the spool as described and cut in two at the center at rightangles to its axis. The spool will then be in six pieces, and will be easily separated after driving out the cigar box wood.

(41) J. W. L. asks (1) if a solid cast iron field magnet will answer as well as Russia sheet iron, for the simple electric motor described by George M. Hopkins, in No. 11, current volume of SCIENTIFIC AMERICAN. A. Cast iron will answer nearly as well as Russia iron. 2. If not, will solid wrought iron do? A. Wrought iron will answer the purpose. 3. Will a solid wrought iron ring answer for the armature, instead of a No. 18 soft iron wire coil? A. Wrought iron will do, but the iron wire is preferable. 4. How are carbon plates made? A. By mixing pulverized coke with pulverized bituminous coal, and baking the mixture in a mould in an oven at red heat while covered with powdered coke to exclude the air. The mould should be inclosed in an iron box.

(42) Mrs. H. asks (1) how to make koumiss out of buttermilk. A. See the article on "The Preparation of Koumiss," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 130. 2. If I have a stream running on my farm, and my neighbor has none, does the law compel me to allow the stream to run to accommodate him? A. If the stream on your land runs to or borders on your neighbor's land, you cannot alter the course of the stream to deprive him of it.

(43) W. S. P. writes: Suppose a bar of iron surrounded by an armature excited by current from some electric source be withdrawn from said armature nearly its full length, will it return entirely within said armature, and with what force? What per cent of the power excited in the armature? A. Send a sketch of the experiment you propose, together with more explicit description.

TO INVENTORS.

An experience of forty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for pri[illegible], which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

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March 27, 1888,

AND EACH BEARING THAT DATE.

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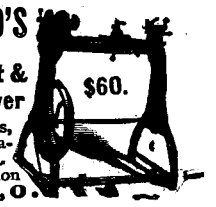

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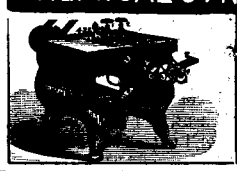

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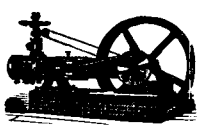

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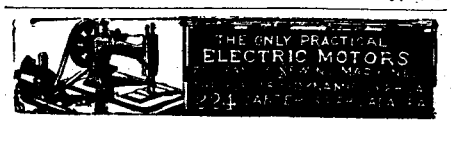

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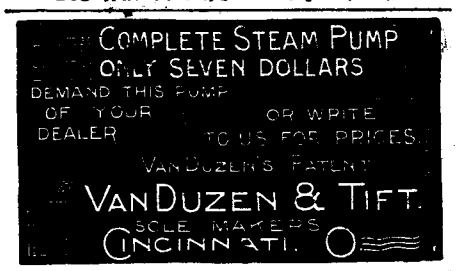

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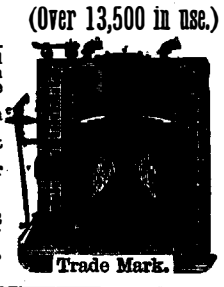

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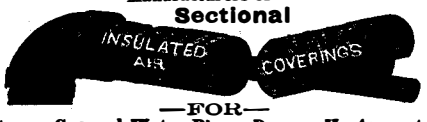

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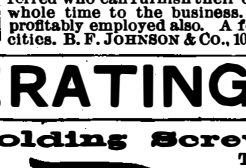

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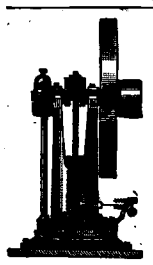

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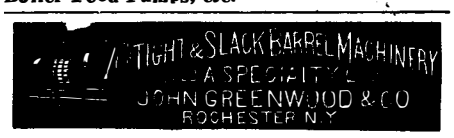

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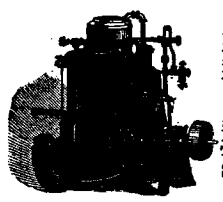

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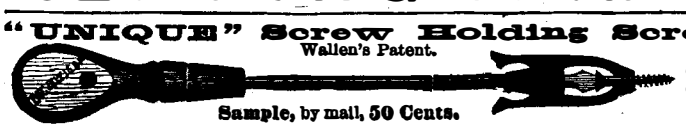

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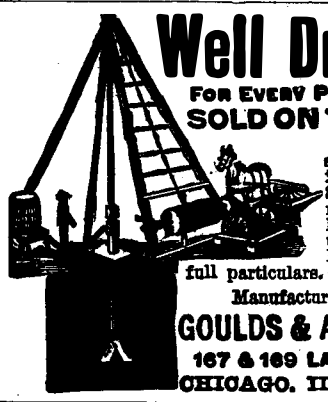

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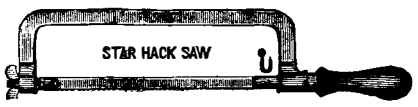

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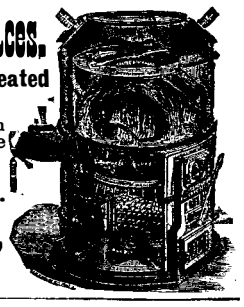

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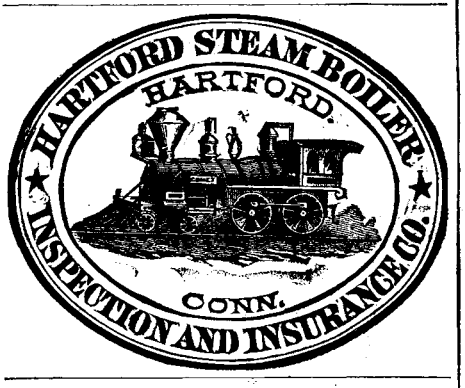

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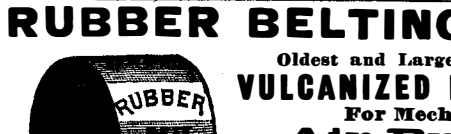

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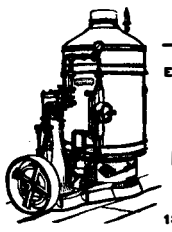

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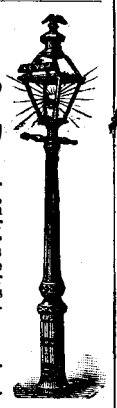

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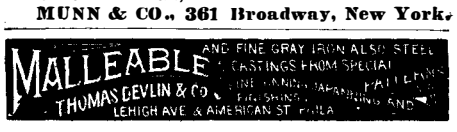

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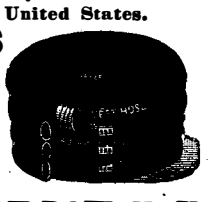

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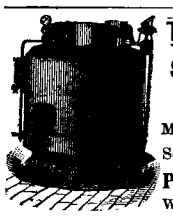

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